

# PAGE'S WEEKLY

A Weekly Newspaper Devoted to the Engineering, Shipbuilding,  
Iron and Steel Trades.

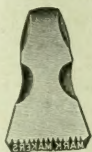
OFFICES: CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

No. 80. VOL. 8.  
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LONDON, FRIDAY, MARCH 23, 1906.

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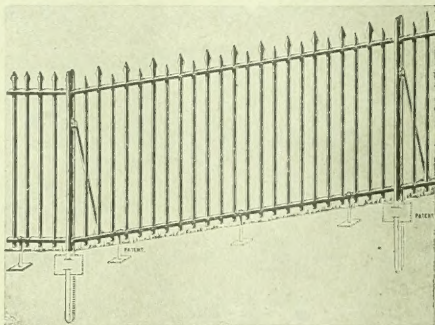
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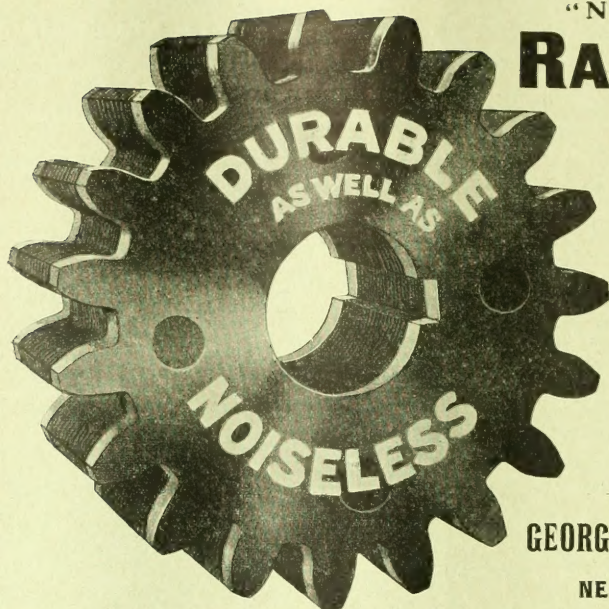
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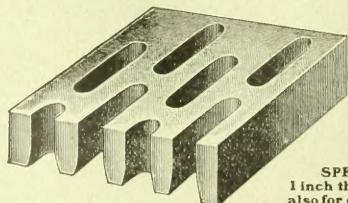
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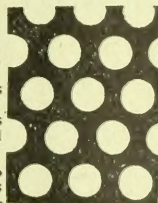
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# PAGE'S WEEKLY

## Miscellaneous

### Mr. G. H. HUGHES, M.I.Mech.E.,

Consulting and Organising Engineer for Water Works and Industrial Undertakings,

19, OLD QUEEN ST., WESTMINSTER, S.W.

Telephone No.: 5754 Bank.

Write for particulars.

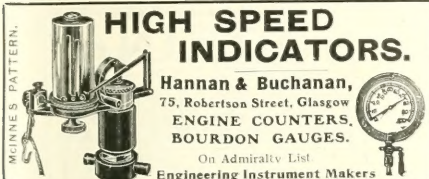
### A. MOUNT-HAES,

M.I.Mech.E., M.I.M.E.,

Consulting and Mining Engineer for Ore Dressing Plants of All Classes.

11, IRONMONGER LANE, LONDON, E.C.

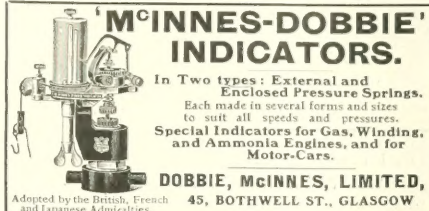
Tel. Address: "DRESSINGS, LONDON." Telephone No.: 272 Central.



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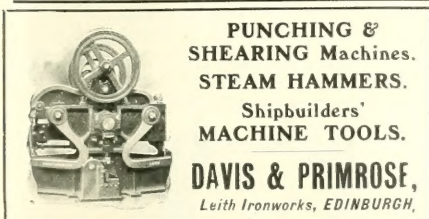
### PATENTS.

Mr. J. G. LORRAIN, M.I.E.E., M.I.Mech.E., Fellow of the Chartered Institute of Patent Agents,  
NORFOLK HOUSE, NORFOLK STREET, STRAND, LONDON, W.C.  
"PATENTEE'S HANDBOOK," post free on application, gives Full Information to Inventors and upon all the chief points of the Patent Law.  
Telegrams: "Lorraine, London."

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#### PATENT WATER-TUBE BOILERS.

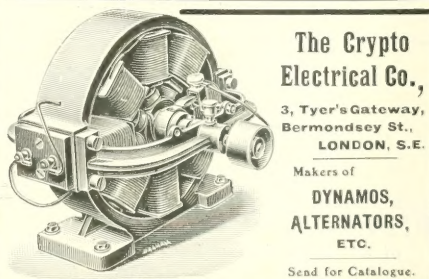
These Boilers are in use throughout the world to the extent of 4,700,000 h.p. generating steam for all purposes, and fired with all kinds of fuel.  
See our Advertisement appearing April 15th, page 37.  
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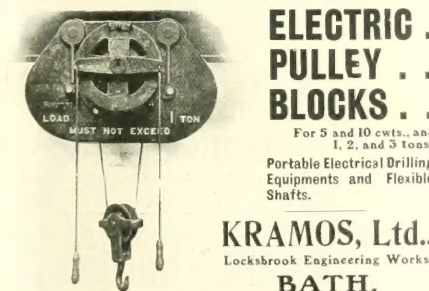
**DAVIS & PRIMROSE,**  
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A Handbook of the Detection, Investigation, and Prevention of Fires and Explosions.

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# PAGE'S WEEKLY

## Miscellaneous

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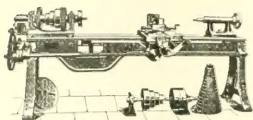
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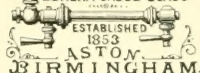
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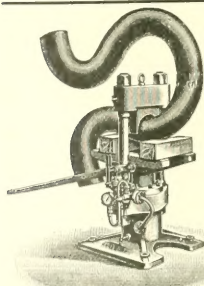
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# PAGE'S WEEKLY

## Miscellaneous

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See  
Next  
Week.

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# PAGE'S WEEKLY

## Contracts

### CONTRACTS.

#### COUNTY BOROUGH OF BOLTON. ELECTRICITY DEPARTMENT.

The Electricity Committee of the County Borough of Bolton are prepared to receive TENDERS for ONE STEAM ENGINE COMPLETE.

Specifications and Forms of Tender may be obtained on and after March 12th, 1906, on application to Mr. ARTHUR A. DAY, A.M.I.C.E., of M.T.E., Borough Electrical Engineer, Spa Road, on payment of £1 1s., which will be returned on receipt of a *bona fide* Tender.

Tenders addressed to the Chairman of the Electricity Committee, Town Hall, Bolton, must be sealed and endorsed "Tender for Steam Engine," and delivered to the undersigned not later than 12 o'clock noon, on Thursday, March 29th, 1906.

The Committee do not bind themselves to accept the lowest or any Tender.

SAMUEL PARKER, Town Clerk.

Town Hall, Bolton, March 27th, 1906.

#### BOROUGH OF WALSALL. ELECTRICITY DEPARTMENT.

TENDERS are requested by the Electricity Department for the following PLANT—

1. 500 h.p. HIGH-SPEED STEAM ENGINE.
2. 350 kW. HIGH-PRESSURE CONTINUOUS-CURRENT DYNAMO.
3. HIGH-PRESSURE FEEDER CABLES, LOW-TENSION DISTRIBUTORS, and PILOT WIRES.

Copies of the Specifications may be obtained from Mr. ALEX. WYLLIE, Borough Electrical Engineer, Wolverhampton Street, Walsall, on payment of £1 1s. for each Specification, which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, endorsed "Tender for Steam Engine," "Tender for Dynamo," or "Tender for Cables," as the case may be, must be addressed to the Town Clerk, Walsall, and must reach his office not later than March 30th.

The Corporation do not bind themselves to accept the lowest or any Tender, and they will not accept the Tender of any firm or person paying less than the standard rate of wages to their own workmen.

JOHN R. COOPER, Town Clerk.

March 13th, 1906.

#### CITY OF LEEDS.—ELECTRIC LIGHTING DEPARTMENT. TURBO-ALTERNATORS, CONDENSERS, &c.

The Electricity Committee of the Leeds City Council are prepared to receive TENDERS for PLANT as below—

- One or Two Sets of Electric Generating and Condensing Plant, each comprising a Steam Turbine, Two-phase Alternator and Exciter of 3,000 kw. capacity, Electrically driven Surface Condensing Plant, and the necessary Pipes and Valves.

Tenders must include the whole of the work specified, as offers of separate sections will not be considered. Preference will be given to Tenders for Plant of British Manufacture. Copies of the General Conditions, Specification, and Form of Tender, may be obtained from Mr. HAROLD DICKINSON, Manager of the Department, 1, Whitehall Road, Leeds, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bona fide* Tender.

Tenders must be in the form attached to the Specification, and must be delivered to me at the Town Hall, Leeds, not later than 10 o'clock in the forenoon, on Monday, the 9th day of April, 1906, in sealed envelopes, endorsed "Electric Lighting—Tender for Generating Plant."

The Corporation do not bind themselves to accept the lowest or any of the Tenders sent in.

Leeds, February 22nd, 1906.

ROBERT E. FOX,  
Town Clerk.

#### HAMBLEDON RURAL DISTRICT COUNCIL.

HASLEMERE WATER WORKS.—CONTRACT No. 1.

TENDERS are invited for SUPPLYING and ERECTING PUMPING MACHINERY capable of raising 3,500 gallons per hour with a lift of 22ft.

Drawings and Specification may be seen and particulars may be obtained at the office of Messrs. R. B. GRANTHAM AND SON, 25, Northumberland Avenue, London, W.C., on and after Monday, the 12th inst., on payment of Five Guineas, which will be returned on the receipt of a *bona fide* Tender.

Tenders on the prescribed form, and marked "Haslemere Waterworks," must be sent to me, the undersigned, Clerk to the Hambledon Rural District Council, Guildford, Surrey, not later than Monday, the 26th inst.

The Council do not bind themselves to accept the lowest or any Tender.

By order,  
FERDINAND SMALLPEICE,  
Guildford, March 5th, 1906. Clerk to the Council.

#### COUNTY OF LONDON—TO CRANE MAKERS, ENGINEERS, AND OTHERS.

The London County Council invites TENDERS for the SUPPLY and ERECTION of THREE 10-TON HAND CRANES.

Persons desiring to submit Tenders may inspect the drawings and obtain the Specifications, Bills of Quantities, form of Tender, and other particulars, at the County Hall, Spring Gardens, S.W., upon payment to the Cashier of the Council of the sum of £2.

This amount will, after the Council or its Committee shall have come to a decision upon the Tenders received, but not before, be returned to the tenderer, provided he shall have sent in a *bona fide* Tender, and not have withdrawn the same, but in no case will the fee be returned unless a *bona fide* Tender is submitted.

Full particulars of the work may be obtained on application at the County Hall previously to the payment of the fee for the Specification, &c.

Tenders must be upon the official forms, and the printed instructions contained therein must be strictly complied with.

The contractors will be bound by the contract to pay all workmen (except a reasonable number of legally bound apprentices) employed by them wages at rates not less, and to observe hours of labour not greater, than the rates and hours set out in the Council's list, and such rates of wages and hours of labour will be inserted in, and form part of, the contract by way of schedule.

Each Tender is to be delivered to the County Hall in a sealed cover, addressed to the Clerk of the London County Council, Spring Gardens, S.W., and marked "Tenders for Cranes, L.C.C. Tramways."

No Tender will be received after 10 o'clock a.m. on Tuesday, the 27th day of March, 1906.

Any Tender which does not comply with the printed instructions for Tender may be rejected.

The Council does not bind itself to accept the lowest or any Tender, and it will not accept the Tender of any person or firm who shall on any previous occasion have withdrawn a Tender after the same had been opened, unless the reasons for the withdrawal were satisfactory to the Council.

G. L. GOMME,

Clerk of the London County Council.

County Hall, Spring Gardens, S.W.,

March 6th, 1906.

#### CITY OF NORWICH. TO STEAM AND HEATING ENGINEERS.

The ASYLUM COMMITTEE invites TENDERS for HEATING and HOT-WATER SUPPLY WORK at the Extensions of the City Asylum, Hellestone, near Norwich.

Plans and Specifications may be seen and Forms of Tender obtained on application at my office on and after the 10th inst.

Tenders, on the forms supplied, enclosed in envelopes sealed with sealing wax, endorsed "Asylum Heating," and addressed to the Chairman of the Asylum Committee, must be delivered at my office not later than 12 at noon on Monday, April 9th next.

The Committee does not bind itself to accept any Tender.

ARTHUR E. COLLINS, M.Inst.C.E.

City Engineer, etc.

Guildhall, Norwich, March 16th, 1906.

#### ASYLUMS COMMITTEE OF THE LONDON COUNTY COUNCIL.

The Asylums Committee of the London County Council are prepared to receive TENDERS for the INSTALLATION of ELECTRIC LIGHTING and POWER (excluding Generating Plant) at the Long Grove Asylum, Epsom, Surrey, now in course of erection.

Instructions for Tender and Forms of Tender and Contract, with Specification and Schedules thereto annexed with plans and cover, can be obtained from the Clerk of the Committee, No. 6, Waterloo Place, London, S.W., on or after Monday, the 26th inst., on payment of a deposit of £5 for each copy.

The amount deposited will, after the Committee have come to a decision upon the Tenders received, but not before, be returned to the Tenderer, provided he shall have sent in a *bona fide* Tender and shall not have withdrawn the same.

Tenders must be on the printed form, and must be accompanied by the Form of Contract and Schedules thereto and bond.

The Tender and accompanying documents, completed in accordance with the instructions, must be enclosed in the authorised sealed cover, endorsed "Tender for Electric Lighting, Long Grove Asylum," and be delivered at the office of the Committee, 6, Waterloo Place, London, S.W., on or before Monday, the 26th of March, 1906, after which no Tender will be received.

Any Tender not made on the printed form, or not filled up and complete in every particular in accordance with the instructions, will be rejected.

The Committee do not bind themselves to accept the lowest or any Tender.

The Contractor will have to enter into a bond in the penal sum of £800, with two approved sureties, each in the sum of £400, as security for the due performance of the contract.

H. F. KEENE,

Clerk of the Asylums Committee.

Asylums Committee Office, 6, Waterloo Place,

February 21st, 1906.



# PAGE'S WEEKLY

## Contracts and Appointments Open

### COUNTY BOROUGH OF SUNDERLAND. ELECTRICITY DEPARTMENT. STEAM ALTERNATOR, &c.

The Corporation of Sunderland are prepared to receive TENDERS for the SUPPLY of—  
ONE 750-kw. TRIPLE EXPANSION ENGINE DIRECT-COUPLED TO THREE-PHASE GENERATOR, 5,000 Volts, with Exciter,  
ONE 300-kw. STATIC TRANSFORMER,  
TWO PORTABLE AIR COMPRESSORS.

The Specification and Form of Tender can be obtained on application to the Borough Electrical Engineer, Mr. J. F. C. SNELL, M.Inst.E.E., at his office, Town Hall, Sunderland, and on payment of a deposit of One Guinea (£1 1s.), which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, addressed to the "Chairman of the Electricity and Lighting Committee," Town Hall, Sunderland, must be delivered at my office not later than 12 o'clock noon on Friday, the 30th day of March, 1906. Tenders to endorsed "Steam Alternator."  
The Corporation do not bind themselves to accept the lowest or any Tender.

Town Hall, Sunderland,  
March 23rd, 1906.

FRAS. M. BOWEY,  
Town Clerk.

### COUNTY BOROUGH OF BOLTON. ELECTRICITY DEPARTMENT.

The Electricity Committee of the County Borough of Bolton are prepared to receive TENDERS for—  
ONE CONTINUOUS-CURRENT ELECTRIC GENERATOR.

Specifications and Form of Tender may be obtained on and after March 12th, 1906, on application to Mr. ARTHUR A. DAY, A.M.I.C.E., M.I.E.E., Borough Electrical Engineer, Spa Road, Bolton, on payment of £1 1s., which will be returned on receipt of a *bona fide* Tender.

Tenders, addressed to the Chairman of the Electricity Committee, Town Hall, Bolton, must be sealed and endorsed "Tender for Electric Generator," and delivered to the undersigned not later than 12 o'clock noon on Thursday, March 29th, 1906.  
The Committee do not bind themselves to accept the lowest or any Tender.

SAMUEL PARKER,  
Town Clerk.

Town Hall, Bolton, March 23rd, 1906.

### COUNTY BOROUGH OF BOLTON. ELECTRICITY DEPARTMENT.

The Electricity Committee of the Bolton Corporation invite TENDERS for the following Materials and Stores for the year ending March 31st, 1907:—

1. LUBRICATING OILS, &c.
2. CLEANING WASTE.
3. JOINT BOXES, SERVICE FUSE BOXES, &c.
4. JOINTERS STORES, MAINS SUNDRIES, &c.
5. METERS.
6. MOTORS AND TRANSFORMERS.
7. MOTOR STARTING SWITCHES.
8. TIMBER.

Forms of Specification and Tender may be obtained on application to Mr. ARTHUR A. DAY, A.M.I.C.E., M.I.E.E., Borough Electrical Engineer, Spa Road, Bolton, on and after March 12th, 1906.

Sealed Tenders on forms provided, endorsed "Contract," to be addressed to the Chairman of the Electricity Committee, Town Clerk's Office, Town Hall, Bolton, and must be delivered not later than 12 o'clock noon, Thursday, March 29th, 1906.  
The Committee do not bind themselves to accept the lowest or any Tender.

SAMUEL PARKER,  
Town Clerk.

Town Hall, Bolton.

### MUNICIPAL COUNCIL OF SYDNEY, N.S.W. ELECTRICITY DEPARTMENT.

The Council is prepared to receive TENDERS for the SUPPLY and ERECTION of—

- A. BOILERS, AUTOMATIC STOKERS, PIPEWORK, &c.
- B. TURBO-ALTERNATOR, SUB-STATION MACHINERY SWITCHBOARDS, &c.

Specifications, Plans, and Form of Tender may be obtained on application to Mr. T. ROUTE, at the offices of Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, on and after Monday, February 12th.  
A deposit of Five Guineas will be required on application, which will be refunded on receipt of a *bona fide* Tender as directed, and a cash deposit or marked cheque for the sum of £1,000 will be required when the Tender is sent in.

Sealed Tenders, endorsed "Tender for Electric Lighting Plant," are to be addressed to the Town Clerk, Town Hall, Sydney, and must be delivered at the Town Hall on or before 4 p.m. Monday, May 7th, 1906.  
The Council do not bind itself to accept the lowest or any Tender.

(Signed) THOMAS H. NESBITT, Town Clerk.

### COUNTY BOROUGH OF STOCKPORT. ELECTRICITY DEPARTMENT.

TO ELECTRICIANS AND ENGINEERS.  
The Electricity Committee are prepared to receive TENDERS for the SUPPLY of ELECTRIC MOTORS of various sizes; also for the SUPPLY and ERECTION of STEAM-DRIVEN CONDENSING PLANT.

Specifications and particulars may be obtained on application to A. J. H. CARTER, Electricity Works, Millgate, Stockport.

Persons tendering for the Condensing Plant must submit particulars of the plant proposed to be supplied three days before sending in their Tender.

Tenders must be endorsed "Motors" or "Condensing Plant," as the case may be, addressed to the Chairman of the Electricity Committee, and handed in at the Town Clerk's Office, Stockport, not later than Thursday noon, the 29th March next ensuing.

No Tender will be accepted without satisfactory proof that the firm tendering pays the trade union rate of wages and observes the trade union number of hours as are usually paid and observed in the district where the goods are made or produced.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,  
ROBERT HYDE, Town Clerk.

Stockport, March 10th, 1906.

## APPOINTMENTS OPEN.

### INDIAN PUBLIC WORKS DEPARTMENT.

The Secretary of State for India in Council will, in the summer of 1906, make not less than TEN APPOINTMENTS of ASSISTANT ENGINEER in the Permanent Establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College.

The age of Candidates must not be less than 21, or more than 24 years on the 1st July, 1906.

A printed Form of Application, together with information regarding the conditions of the appointments and certain requirements laid down as to education and experience in engineering, may be obtained from the Secretary, Public Department, India Office, Whitehall, London, S.W.

The Form of Application is to be returned so as to reach him not later than Tuesday, 1st May next.

India Office, December 10th, 1905.  
A. GODLEY,  
Under Secretary of State.

### CIVIL SERVICE COMMISSION. FORTHCOMING EXAMINATION. ASSISTANT EXAMINERS IN THE PATENT OFFICE (20-25 April 3th).

The date specified is the latest at which applications can be received. They must be made on forms to be obtained, with full particulars, from the Secretary, Civil Service Commission, Burlington Gardens, London, W.

BOMBAY, BARODA, AND CENTRAL INDIA RAILWAY COMPANY.

THE Directors are prepared to receive APPLICATIONS (by letter only) for APPOINTMENT as ASSISTANT ENGINEER in the Way and Works Department in India.

Candidates should not be more than 30 years of age, and must have received a good scientific education at a recognised engineering college, and have had thereafter at least a year's experience in practical work.

Salary: Rupees 350 per calendar month.

Terms: A three years' engagement and first-class free passage to India and home again (unless forfeited by misconduct).

The Candidate selected will be required to pass a medical examination by the Company's Consulting Physician before appointment.

Letters of application, marked "Assistant Engineer," with copies (not originals) of testimonials, should be addressed to the undersigned not later than the 3rd April next.

T. W. WOOD, Secretary.  
Offices, Gloucester House, Bishopsgate Street Without,  
London, E.C., March 15th, 1906.

### THE MARINE SCHOOL OF SOUTH SHIELDS.

The Governors of the above School invite APPLICATIONS for the APPOINTMENT of an ADDITIONAL INSTRUCTOR for the Marine Engineering Department.

Candidates must hold an Extra First-class Board of Trade Certificate, and have a sound knowledge of modern Steamship Auxiliary Machinery, Dynamos, Water-tube Boilers, Refrigeration, &c., and must be able to Lecture.

Commencing salary £120 per annum.  
Applications, stating age, experience at sea and in teaching, and qualifications, together with copies of not more than three testimonials of recent date, to be addressed to undersigned by March 31st, 1906.  
Enclosures should be marked "M.E. Instructor" on the outside.

SECRETARY,  
The Marine School of South Shields.

# Buyers' Directory.

NOTE.—The display advertisements of the firms mentioned under each heading can be found by readily reference to Alphabetical Index to Advertisers on pages 22 and 24.

In order to assure fair treatment to advertisers, each firm is indexed under its leading specialty ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

## Advertisers' Service Bureau.

British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

## Artesian Well Machinery.

John Z. Thom, Patricroft, Manchester.

## Band Sawing Machines.

Noble & Lund, Ltd., Felling-on-Tyne.

## Bearings (Roller).

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

## Belted.

Emmey & Son, Catherine Street, City Road, London, E.C.

Cort, Arthur & Co., Camberwell, London, S.E.

Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.

Gilmour, W. & O., St. John's Hill, Edinburgh.

## Boilers.

Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.

Hartley & Sugden, Ltd., Halifax.

Thompson, John, Wolverhampton.

## Boilers (Water-tube).

Babcock & Wilcox, Ltd., Oriol House, Farringdon Street, London, E.C.

Strirling Boiler Co., Ltd., Motherwell, N.E.

## Bolts, Nuts, Rivets, etc.

Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.

Herbert W. Ferriar, Ltd., Floodgate Street Works, Birmingham.

T. D. Robinson & Co., Ltd., Derby.

## Books.

Grimm, Charles & Co., Exeter Street, Strand, W.C.

New Zealand Mines Record, Wellington, New Zealand.

Spon, E. & F. N., 125, Strand, W.C.

## Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Noble & Lund, Ltd., Felling-on-Tyne.

Swift, George, Clarence Ironworks, Halifax.

## Cables.

Callender's Cable and Construction Co., Ltd.

## Case-Hardening Compounds.

Hy. Miller & Co., Milgath Works, Leeds.

## Castings.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

## Catalogues, Printing, &c.

Atlantic Press, Ltd., Weymouth Street, Manchester.

Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.

Staford, Arthur & Co., Denton, Manchester.

## Chucks.

Fairbanks Co., 78-80, City Road, London, E.C.

## Cisterns, Tanks, &c.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Clayton, Son & Co., Ltd., Hunslet, Leeds.

F. A. Kepp, Juxon & Co., Barn Street, Birmingham.

## Clutches (Friction).

David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

## Condensing Plant.

Benn, Sykes, Haslingden, near Manchester.

Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.

Mirrlees-Watson & Co., Ltd., Glasgow

## Consulting Engineers.

Gibbs, John & Son, 80, Juke Street, Liverpool.

G. H. Hughes, A.M.I.M.E., 19, Old Queen Street, Westminster, S.W.

Melville & Macdonald, 605, Walnut Street, Philadelphia, Pa., U.S.A.

Mount-Haes, A., M.I.Mech.E., M.I.M.E., 11, Ironmonger Lane, London, E.C.

## Continental Railway Arrangements.

Northern Railway of France.

South Eastern & Chatham Railway Co.

## Conveying and Elevating Machinery.

Adolf Bleichert & Co., Leipzig-Gohlis, Germany.

Temperley Transporter Co., 72, Bishopsgate Street Within London, E.C.

## Copper and Brass.

W. Hepton & Son, Hunslet Lane, Leeds

## Coverings (Boiler).

Magnesia Covering Ltd., Washington Station, co. Durham.

## Cranes, Travellers, Winches, etc.

Joseph Booth & Bros. Ltd., Rodley, Leeds.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

## Cranks.

Carke's Crank & Forge Co., Ltd., Lincoln, England.

## Cutters (Milling).

Coventry Ordnance Works, Ltd., Coventry.

Fratt & Whitney Co., 23-25, Victoria Street, London, S.W.

E. G. Wroget & Co., Ltd., Foundry Lane Works, Solihull, Birmingham.

## Destructors.

Heenan & Froude, 4, Chapel Walks, Manchester.

Horsfall Destructor Co., Ltd., Armley, Leeds.

## Dredges and Excavators.

Delange & Cie, Meca, Hoboken, near Antwerp.

Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

## Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Noble & Lund, Ltd., Felling-on-Tyne.

Swift, George, Clarence Ironworks, Halifax.

## Economisers.

E. Green & Son, Ltd., Manchester.

## Ejectors (Pneumatic).

Hughes & Lancaster, 16, Victoria Street, London, S.W.

## Electrical Apparatus.

Allgemeine Elektricitäts-Gesellschaft, Berlin, Germany.

British Westinghouse Electric and Manufacturing Co., Ltd., Norfolk

Street, Strand, London, W.C.

Broadbent, T. W., Victoria Electrical Works, Huddersfield.

Crypto Electrical Co., 3, Tyer's Gateway, Bernondsey Street,

London, S.E.

Ebonestos Manufacturing Co., 22, Rosoman Street, London, E.C.

Gent & Co., Ltd., Paraday Works, Leicester.

Greenwood & Bailey, Ltd., Albion Works, Leeds.

India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.,

Silvertown, London, E.

Johnson and Phillips, Ltd., Victoria Works, Old Charlton, Kent.

Matthews & Yates, Ltd., Swinton, Manchester.

Mix and Genest, Berlin, W., Germany.

Nalder Bros. & Thompson, 34, Queen Street, London, E.C.

New Gutta Percha Co., Ltd., Dushwood House, New Broad Street,

London, E.C.

Newton Brothers, Full Street, Derby.

Phoenix Dynamo Manufacturing Co., Bradford, Yorks.

Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.

Turner, Atterton & Co., Ltd., Denton, Manchester.

B. Weaver & Co. (as Ebonestos Manufacturing Co.), 22, Rosoman

Street, Clerkenwell, London, E.C.

## Engineers' Supplies.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.

## Engines (Gas).

Campbell Gas Engine Co., Ltd., Halifax.

Cundall, Son & Co., Ltd., Airedale Iron Works, Shipley.

## Engines (Electric Lighting).

McLaren, J. and H., Midland Engine Works, Leeds.

## Engines (Locomotive).

Barclay, Andrew, Sons & Co., Ltd., Caledonia Works, Kilmarnock

N.B.

Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.

Hunslet Engine Co., Ltd., Leeds, England.

Hudswell, Clarke & Co., Ltd., Leeds, England.

McLaren, J. & H., Midland Engine Works, Leeds.

## Engines (Oil).

Brown & May, Ltd., Devizes.

## Engines (Stationary).

Mirrlees Watson Co., Ltd., Glasgow.

## Engines (Traction).

Jno. Fowler & Co. (Leeds) Ltd., Steam Plough Works, Leeds.

## Engravers.

Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

## Exhaust Steam Oil Separators.

Lancaster & Tongue, Ltd., Pendleton, Manchester.

## Fans, Blowers.

Capel Fan Co., 13, Mosley Street, Newcastle-on-Tyne.

Davidson & Co., Ltd., "Sirocco" Engineering Works, Enfield,

Ireland.

Gibbs, John & Son, 80, Juke Street, Liverpool.

Matthews & Yates, Ltd., Swinton, Manchester.

## Fencing and Gales (Iron).

Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.

## Files.

Flockton, Tomplin & Co., Ltd., Newhall Steel Works, Sheffield.

## Fire Bricks.

J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

## Firewood Machinery.

M. Glaver & Co., Patentees and Saw Mill Engineers, Leeds.

Hill and Heibert, Ltd., Great Central Street, Leicester.



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# STEEL WIRE ROPES

## AND APPLIANCES.

**FLEXIBLE STEEL WIRE ROPES**

FOR

**Cranes, Lifts, Hoists, Etc.**

**ABSOLUTELY RELIABLE.**

**ONLY ONE UNIFORM QUALITY.**

**Blocks, Pulleys,  
Crab Winches, Tackle, Etc.**

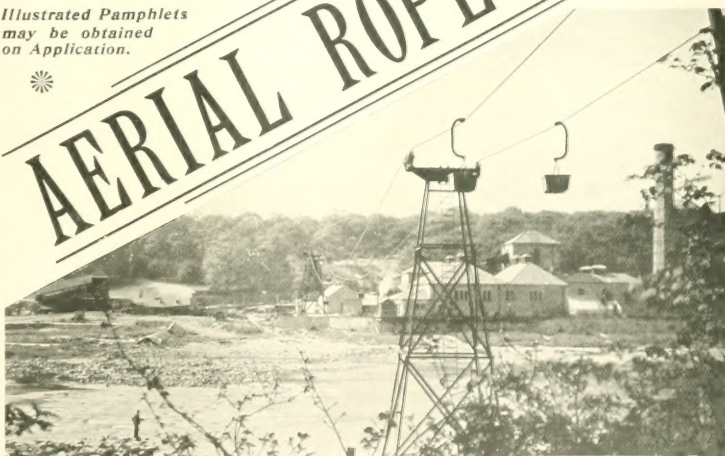
**MINING & HAULING  
PLANT.**

*Illustrated Pamphlets  
may be obtained  
on Application.*



**AERIAL ROPEWAYS**

ON ALL  
SYSTEMS



ROPEWAY AT WYLLAM-ON-TYNE.

**Ropeways Constructed to Convey from 50 to 2,000 Tons per day to Transport all Descriptions of Materials.**

Regd. Offices :

**BULLIVANT & CO., Ltd.,**

Works :

72, MARK LANE. Telephone No. : 2110 Avenue. **LONDON, ENGLAND.** MILLWALL, E.

## Buyers' Directory—(Continued).

### Fountain Pens.

Mabie, Todd & Bard, 93, Cheapside, London, E.C.

### Forging (Drop) Plants.

Brett's Patent Lifter Co., Ltd., Coventry.

### Forgings (Drop).

J. H. Williams & Co., Brooklyn, New York, U.S.A.

### Furnaces.

Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.  
Leeds Forge Co., Ltd., Leeds.

### Gauge Glasses.

J. B. Treasure & Co., Vauxhall Road, Liverpool.  
Torrey, J., & Sons, Aston, Birmingham.

### Gauges (Pressure, Vacuum, and Hydraulic).

Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.

### Gearing.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.  
Angus, G. & Co., Ltd., Newcastle-on-Tyne.  
Asquith, William, Ltd., Well Road Works, Halifax.  
Dixon, W. F. & Co., 60, Percival Street, C. on-M., Manchester.  
Reid Gear Co., Linwood, near Glasgow.  
Wild, M. B., & Co., Argyle Street, Nethells, Birmingham.

### Greases.

Bilman and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

### Hack Saws.

Baynes, Charles, Knuzden Brook, Blackburn.

### Hammers (Steam).

Davis & Primrose, Leith Ironworks, Edinburgh.

Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

### Hoisting Machinery.

See Conveying Machinery.

### Horizontal Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.  
Greenwood & Batley, Albion Works, Leeds.  
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.  
Noble & Lund, Ltd., Felling-on-Tyne.  
Swift, George, Clarence Ironworks, Halifax.

### Hydraulic Leather.

Ablers, Ad., Whitley Bay, near Newcastle-on-Tyne.

### Hydraulic Machine Tools.

Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.  
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.

### Icemaking and Refrigerating Machinery.

H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

### Indicators.

Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.  
Hannan & Buchanan, 75, Robertson Street, Glasgow.

### Iron and Steel.

Allen, Edgar, & Co., Ltd., Imperial Steel Works, Sheffield.  
Askham Bros. & Wilson, Ltd., Sheffield.  
Euckley, Saml., St. Paul's Square, Birmingham.  
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.  
Farney Iron Co., Ltd., Leeds, England.  
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.  
Fried. Krupp, Gussowwerk, Magdeburg-Buckau, Germany.  
J. Frederick Melling, 14, Park Row, Leeds, England.  
Parker Foundry Co., Derby.  
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.  
Roe Steel Castings Co., Ltd., Temple Bar House, Fleet Street, London, E.C.  
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

### Ironwork (Constructional).

F. A. Keep, Juxon & Co., Barn Street, Birmingham.

### Ironwork (Galvanised).

F. A. Keep, Juxon & Co., Barn Street, Birmingham.

### Lathes.

Asquith, William, Ltd., Well Road Works, Halifax.  
Bradbury & Co., Ltd., Wellington Works, Oldham.  
Dean, Smith, and Grace, Ltd., Keighley.  
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.  
Lockenby, Benton, & Co., Perseverance Ironworks, Halifax.  
Mitchell, D., & Co., Ltd., Parsonage Works, Keighley.  
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.  
Noble & Lund, Ltd., Felling-on-Tyne.  
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.  
Swift, George, Clarence Ironworks, Halifax.

### Lathe Carriers

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

### Laundry Machinery.

Hill and Herbert, Ltd., Great Central Street, Leicester.  
Summerscales, W., & Sons, Ltd., Engineers, Phoenix Foundry, Keighley, England.

### Lifts.

Waygood & Co., Ltd., Falmouth Road, London, S.E.

### Lubricants.

Bismann & Stern, Ltd., Plough Bridge, Deptford, London, S.E.  
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.

### Machine Tools.

Asquith, William, Ltd., Well Road Works, Halifax.  
George Addy & Co., Waverley Works, Sheffield.  
Bateman's Machine Tool Co., Hunstley, Leeds.  
Beanland, Perkin, & Co., School Close Works, Leeds.  
Bertrams, Ltd., St. Katherine's Works, Scienner, Edinburgh.  
Bradbury & Co., Ltd., Wellington Works, Oldham.  
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhin, Germany.  
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.  
Cunliffe & Groom, Ltd., Broughton Ironworks, Manchester.  
Dean, Smith & Grace, Ltd., Keighley.  
Dempster, Moore & Co., Ltd., 49, Robertson Street, Glasgow.  
Fengl, A., & Co., Grafton Street, Altrincham.  
Greenwood & Batley, Ltd., Leeds.  
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.  
John Lang & Sons, Johnstone, near Glasgow.  
Luke & Spencer, Ltd., Broadheath, Manchester.  
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.  
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.  
Noble & Lund, Ltd., Felling-on-Tyne.  
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.  
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.  
C. Redman & Sons, Halifax.  
Resides, 12, Aire Street, Brighouse, Yorks.  
Rice & Co. (Leeds), Ltd., Leeds, England.  
G. F. Smith, Ltd., South Parade, Halifax.  
Swift, George, Clarence Ironworks, Halifax.  
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.  
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.  
H. W. Ward & Co., Lionel Street, Birmingham.  
T. W. Ward, Albion Works, Sheffield.  
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.  
Winn, Charles, & Co., St. Thomas Works, Birmingham.  
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

### Machinery Merchants.

Greenwood, Thomas, Waterside, Halifax.

### Marks.

Pryor, Edward, & Son, 68, West Street, Sheffield.

### Metals.

Delta Metal Co., Ltd., East Greenwich, London, S.E.  
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.  
Phosphor Bronze Co., Ltd., Southwark, London, S.E.  
Metals (Perforated).  
Brown, Andrew, & Co., 110, Cannon Street, London, E.C.  
Megin, Fr. & Co., Ltd., Engineers, Works, Dillingen-on-Saar.  
Stanier, John, & Co., Manchester Wire Works, Manchester.

### Mining Drill Steel.

Flockton, Tompkin, & Co., Ltd., Newhall Steel Works, Sheffield.

### Office Appliances.

Devis & John, & Son, Ltd., 30, All Saints' Works, Derby.  
Halden & Co., J., 8, Albert Square, Manchester.  
Hall & Co., R. J., 39, Victoria Street, London, S.W.  
Inglesart, T., & Sons, Ltd., Atlas House, Leicester.  
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.  
Rockwell-Wabash Co., Ltd., 69, Milton Street, London, E.C.  
Shannon, Ltd., Ropemaker Street, London, E.C.  
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

### Oils, &c.

Bismann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

### Oil Filters and Cabinets.

Vator Co., Ltd., Rocky Lane, Aston Cross, Birmingham.

### Packing.

Beldan Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.  
Lancaster & Tongue, Ltd., Pendleton, Manchester.  
Redfern & Co., S. Swan Lane, New Brown Street, Manchester.  
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, 1, C. United States Metallic Packing Co., Ltd., Bradford.

### Paper.

Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.

### Patent Agent.

Lorrain, J. G., M.I.E.E., M.I.Mech.E., Norfolk House, Norfolk Street Strand, London, W.C.



PAGE'S WEEKLY

Wells' Specialities

# WELLS' PATENT "Waste Oil" FILTERS

FITTED WITH SIGHT-FEED SYPHON.

SUPPLIED TO THE PRINCIPAL GOVERNMENTS FOR  
THE NAVY, DOCKYARDS, &c., AND TO THE LEADING  
ELECTRIC LIGHT INSTALLATIONS, ENGINEERING  
WORKS, GAS ENGINE MAKERS, PRINTERS, &c., &c.

## OVER 11,000 SOLD.

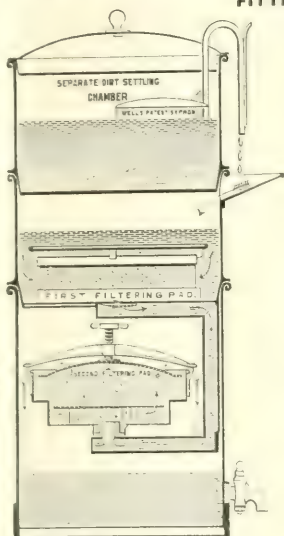
### MONEY SAVERS to any USERS OF MACHINERY.

Pay first cost in a short time, as Dirtied Oil, which has hitherto been thrown away, can be filtered and used again and again.

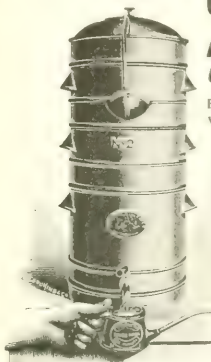
Write for List of Testimonials and Samples of Work done by the Filter.

No. 1.	1 in. dia. 1 ft. high. Capacity 1 gallon. Price 1/6	35/-
No. 2.	1 in. dia. 2 ft. high. Capacity 2 gallons. Price 1/6	50/-
No. 3.	1 in. dia. 3 ft. high. Capacity 3 gallons. Price 1/6	70/-
No. 4.	1 in. dia. 4 ft. high. Capacity 4 gallons. Price 1/6	110/-
No. 5.	1 in. dia. 5 ft. high. Capacity 5 gallons. Price 1/6	189/-
No. 6.	1 in. dia. 6 ft. high. Capacity 6 gallons. Price 1/6	330/-

LARGER SIZES MADE TO ORDER.



WELLS' PATENT WASTE OIL FILTER.



## NO OUTSIDE POWER REQUIRED.

### LIME, WHITING, OR COLD WATER PAINTS,

Applied at a speed of from 8 to 10 square yards per minute, in a manner superior to brush work.

One coat will the Machine on rough surfaces is equal to two applied with a brush.

### Will save First Cost in a Few Days.

No. 6A.	Small size with 1 ft. high. Price 1/6	£5 15s.
No. 4.	Price, with 5 ft. Pole, Single Spraying Nozzle, and 20 ft. Special Armoured Hose. Capacity 6 gals.	£8 10s.
No. 4A.	Price, with 10 ft. Pole, 2 ft. Pole, Single Spraying Nozzle, and 20 ft. Special Armoured Hose. Same capacity as No. 4 Machine.	£9 10s.
No. 5.	With 5 ft. Pole, 2 ft. Pole, 2 ft. Pole, and 20 ft. Special Armoured Hose. Large size. Capacity 10 gals.	£10 10s.
No. 5A.	Price, with 10 ft. Pole, 2 ft. Pole, 2 ft. Pole, and 20 ft. Special Armoured Hose. Largest size. Capacity 12 gals.	£11 15s.

### WELLS' IMPROVED LIMEWASH.

MUCH SUPERIOR TO ORDINARY LIMEWASH. SLAKED WITH WATER QUICKLY MIXED. WILL NOT RUB OFF. LEAVES A GOOD SURFACE.

Price 13/8 per cwt.,

Carriage Paid in England and Wales, (if in lots of 3 cwt. at a time, 12/8 per cwt.)

**A. C. WELLS & Co.,**  
100a, Midland Road, St. Pancras,  
Works: Cheetham, Manchester. LONDON, N.W.

## WELLS' "LIGHTNING" LIME & COLOR WASHER



No. 1, with Wheels.

## Buyers' Directory—(Continued).

### Photo Copying Frames.

J. Halden & Co., 8, Albert Square, Manchester.  
B. J. Hall & Co., 39, Victoria Street, London, S.W.

### Photographic Apparatus.

Marion & Co., Ltd., 22 and 23, Soho Square London, W.

### Pinch Bars.

Samson & Co., Garforth, near Leeds.

### Pipe Wrenches (Chain).

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

### Pistons.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

### Planned Sheets.

Zeitz & Co., 21, Lime Street, London, E.C.

### Pneumatic Tools.

Consolidated Pneumatic Tool Co., Ltd., Palace Chambers,  
9, Bridge Street, Westminster, S.W.

### Porcelain.

Gustav Richter, Charlottenburg, near Berlin, Germany.

### Presses (Hydraulic).

Greenwood & Bailey, Albion Works, Leeds  
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

### Publishers.

Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.  
Spott, E. and F. N., 125, Strand, W.C.  
New Zealand Mines Record, Wellington, New Zealand.

### Pulley Blocks.

Kramos Ltd., Locksbrook Engineering Works, Bath.

### Pumps and Pumping Machinery.

Drum Engineering Co., 33, Brook Street, Bradford.  
Enke, Carl, Schkeuditz-Leipzig, Germany.  
Fraser & Chalmers, Ltd., 7, London Wall Buildings, London, E.C.  
J. F. Hall & Sons, Ltd., Peterborough.  
Hathorn, Davey & Co., Ltd., Leeds, England.  
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.

### Radial Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.  
Greenwood & Bailey, Albion Works, Leeds.  
Mitchell, D., & Co., Ltd., Parsonage Works, Keighley.  
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.  
Noble & Lund, Ltd., Felling-on-Tyne.  
Northern Engineering Co., (1900), Ltd., King Cross, near Halifax.  
Swift, George, Clarence Ironworks, Halifax.

### Rails.

Wm. Firth, Ltd., Leeds.

### Railway and Tramway Fastenings.

Bayless, Jones & Bayless Ltd., Monmore Green, Wolverhampton.

### Riveted Work.

F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

### Roller Bearings.

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

### Roofs.

D. Anderson & Son, Ltd., Lurgan Belt Works, Belfast.  
Clayton, Son & Co., Ltd., Hunslet, Leeds.  
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.  
McTear & Co., Ltd., Newtownards Road, Belfast.  
Mellows & Co., Ltd., Sheffield.

### Ropeways (Aerial).

Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.  
Fohlig, J., Ltd., Cologne, Germany.

### Scientific Instruments.

Cambridge Scientific Instrument Co., Ltd., Cambridge.

### Shearing and Punching Machines.

Becker, R., & Co., 57, City Road, London, E.C.

### Slitting Machines.

Noble & Lund, Ltd., Felling-on-Tyne.  
Swift, George, Clarence Ironworks, Halifax.

### Spanners.

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

### Stampings.

Thomas Smith & Sons of Salford, Ltd., Birmingham.  
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

### Stamps (Rubber).

Rubber Stamp Co., 1 & 2, Holborn Buildings Broad Street Corner Birmingham.

### Stamps (Metal).

Edward Pryor & Son, 68, West Street, Sheffield.

### Steam Traps.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

### Steam Wagons.

Thornycroft & Co., Ltd., J. I., Chiswick, London, W.  
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

### Steel Structures.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.  
Clayton, Son & Co., Ltd., Hunslet, Leeds.

### Steel Tools.

Buckley, Saml. St. Paul's Square, Birmingham.  
Frat & Whitney Co., 23-25, Victoria Street, London, S.W.

### Steel (Tool Steel).

Buckley, Saml., St. Pauls Square, Birmingham.  
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

### Stokers.

Ed. Bennis & Co., Ltd., Bolton, Lanes.

### Stone Breakers.

S. Pegg & Son, Alexander Street, Leicester.

### Superheaters.

A. Bolton & Co., 19, Deansgate, Manchester.

### Testing Machines.

Denison, Saml., & Son, Ltd., Hawley Moor, near Leeds.

### Time Recorders.

Howard Bros., 40, Paradise Street, Liverpool, and 100b, Queen Victoria Street, London, E.C.

### Tubes.

Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.  
Tubes, Ltd., Birmingham.

### Turbines.

Greenwood & Bailey, Albion Works, Leeds.  
S. Howes Co., 64, Mark Lane, London, E.C.

### Typewriters.

Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.  
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

### Valves.

Holmes & Co., W. C., Huddersfield.  
Hopkinson, J. & Co., Ltd., Britannia Works, Huddersfield.  
Hunt & Mitton, Crown Brass Works, Ozels Street, North, Birmingham.  
Scotch and Irish Oxygen Co., Ltd., Rosehill Works, Glasgow.  
Shaw, Joseph, Albert Works, Huddersfield.  
Wian, Charles, & Co., St. Thomas Works, Birmingham.

### Ventilating Appliances.

Mathews & Yates, Ltd., Swinton, Manchester.

### Water Softeners and Purifiers.

Lassen & Hjort, 52, Queen Victoria Street, London, E.C.

### Wagons—Steam.

Thornycroft & Co., Ltd., Ltd., Chiswick, London, W.  
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

### Weighing Apparatus.

W. & T. Avery, Ltd., Soho Foundry, Birmingham, England.  
Denison, Saml., & Son, Ltd., Hunslet Moor, near Leeds.

### Wells Light.

A. C. Wells & Co., 100A, Midland Road, St. Pancras, London, N.W.

### Wire Ropes.

Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

### Wire Working Machinery.

Ed. Brand, 35, Shakespeare Street, Manchester.

### "Wooddite."

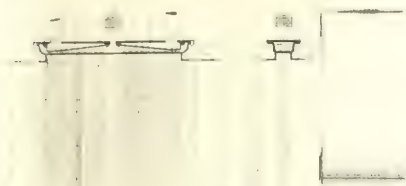
"Wooddite" Company Mitcham, Surrey.



# PAGE'S WEEKLY

## Miscellaneous

### TO STEAM USERS.



#### OVER 400 WORKING,

Averaging a saving of 15 per cent. of coal and 30 per cent. of water. Repeat Orders coming in.

#### RELIEVE YOUR BOILERS.

Increase the efficiency of your Engines and improve Production by placing BOLTON'S SUPERHEATER in the Back or Down-take Flue.

To Dry and Super-heat the Steam.

**A. BOLTON & CO.,**

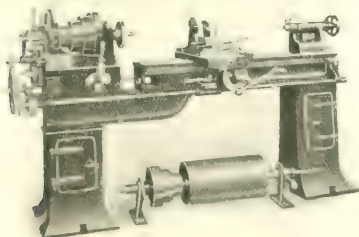
Engineers and Contractors,

49, Deansgate, MANCHESTER.

## YOST

THE TYPEWRITER FOR BEAUTIFUL WORK.

THE YOST TYPEWRITER CO., Ltd.,  
50, Holborn Viaduct, London.



### High-Speed Lathes,

ENTIRE  
OUR SPECIALITY.

new design arranged to admit large cone and

**LECKENBY, BENTON & CO.,**  
Perseverance Ironworks, HALIFAX.

in Centre Lathe for High-speed Steel,

Telegrams: "MILLING. SHEFFIELD." For the Latest and most Up-to-Date  
National Telephone No.: 685.



PLATE BENDING MACHINE.

## HEAVY- = MACHINE TOOLS = =

Also Special Lifting Jack for Electric  
Teamsters.  
WRITE TO:  
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WAVERLEY WORKS, SHEFFIELD.

# PAGE'S WEEKLY Machine Tools

## CUNLIFFE & CROOM, Ltd.

Broughton Lane,  
MANCHESTER, England.

Telegraphic Address  
"Lathe, Manchester."

Showrooms  
66, VICTORIA ST.,  
MANCHESTER.

Ask for Descriptive Sheet.

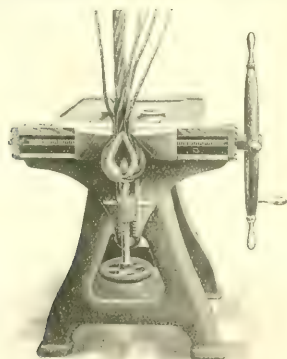
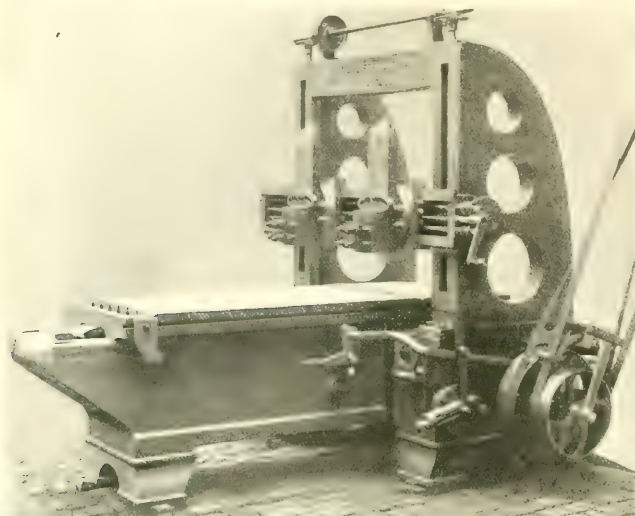
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**Planing . .  
Machines.**

### SPECIAL FEATURES

Deep Bed, Strong Table  
Unrestricted Belt Angle.  
All Gears and Rack Cut  
Absolutely No Shock  
when Reversing.

### REVISED PRICES.

Full face to machine tool. Inverse can  
be fitted to machine tool for a given con-  
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Cable Bending and Splicing Vise.

SEND FOR DESCRIPTION.

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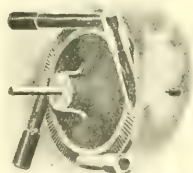
## GREENWOOD & BATLEY, Ltd.

LEEDS.

Machine Tools.

Dynamos & Motors.

De Laval's Patent  
Steam Turbines.

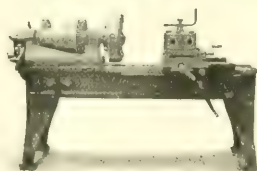


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OUR SPECIALITY

**HIGH-GRADE  
MACHINES**

only, in stock for  
immediate  
Delivery.



Established 1871.

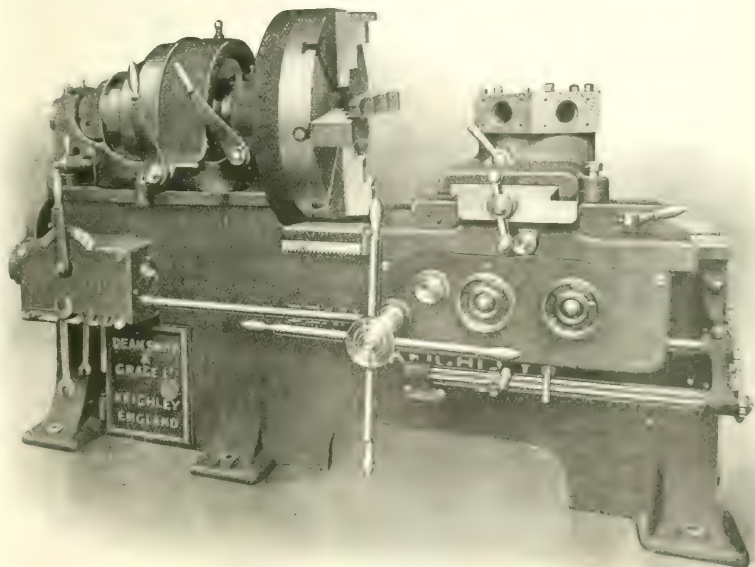
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# PAGE'S WEEKLY Machine Tools

## An Ideal Lathe for Power and Handiness

IS THIS 24-in. SWING SURFACING AND  
BORING LATHE FOR HIGH SPEEDS.



Specially adapted for Machining Motor Car parts.

SEND FOR 1905 CATALOGUE.

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**KEIGHLEY.**

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# PAGE'S WEEKLY

## Machine Tools

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CLARENCE · HALIFAX, England.  
IRON WORKS

Telephone No. 117. T. 117. S. 117. H. 117.

### Slotting Machines

From 6 in. to 18 in. Stroke.

Complete Catalogue on request.

These Machines are exceptionally light for the drive and wide, and are also built in sizes of 6 in., 8 in., 10 in. and 12 in. Machines with 3 in. stroke. Accompanying illustration is of my 8 in. STROKE MACHINE, with Balance Ram, and Reversing Control. I should be glad to submit the particulars of this or any other of my tools on application.

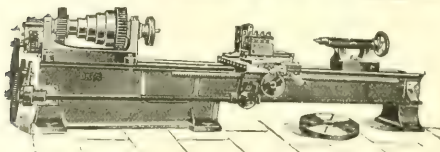
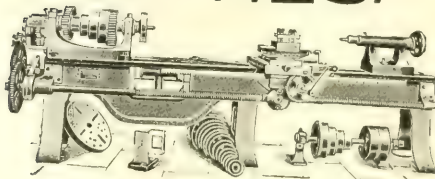
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### The JOS. C. NICHOLSON TOOL CO.

Engineers and Machine Tool Makers,  
NEWCASTLE-ON-TYNE.

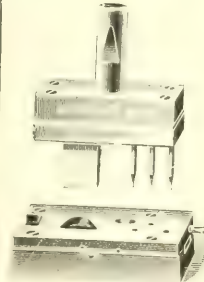
POWERFUL "STANDARD"  
Screen-Cutting, Sliding and Surfacing  
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PRESS TOOLS,  
JIGS, CUTTERS,  
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GAUGES?

If so, send your  
requirements, and



**A. FENGL & Co.,**  
ALTRINCHAM,

Will submit design and price.

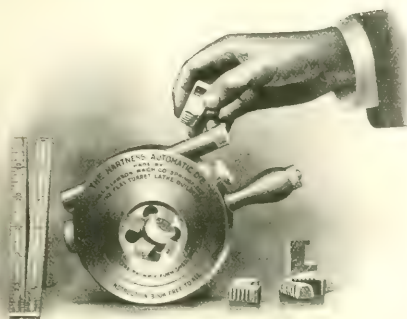
INVENTORS' MODELS WORKED OUT AND  
MANUFACTURED.

STAMPINGS TO THE TRADE.



# PAGE'S WEEKLY

## Machine Tools



### Hartness Automatic Die

*The most satisfactory means yet devised for the production of screw threads.*



THIS Die is not only used on all Hartness Flat Turret Lathes, but is now working on nearly all other makes of Turret Lathes. The new No. 4 is admirably suited to Automatic Machines.

Cam takes bearing direct on back of Chasers, insuring almost perfect lead.

Chasers can be instantly changed.

The adjustment is the easiest of any Die on the market.

All regular Chasers (or Screwing Dies), together with many special and Acme sizes, kept constantly in stock.



Write to-day, giving particulars of your requirements to

## JONES & LAMSON MACHINE CO.

"Jubilee Buildings," 97, Queen Victoria Street,

### LONDON.

Telegram: "Turret Lathe, London"

Telephone: No. 414, London.

General Agents: Messrs. J. & W. G. & Co., Ltd., London.



# Twist Drills and Milling Cutters

Manufactured from Cammell Laird & Co.'s

## 0172 HIGH-SPEED STEEL

CAN BE OBTAINED FROM—

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2, Whitechapel Road, E.  
C. W. BURTON GRIFFITHS & Co.,  
Ludgate Square, Ludgate Hill, E.C.  
C. CHURCHILL & Co., Ltd.,  
9, Leonard Street, Finsbury Pavement, E.C.  
SCHUCHMAYER & SCHUTTLER,  
34, Victoria Street, S.W.

### GLASGOW.

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C. W. BURTON GRIFFITHS & Co.,  
57, Edmiston Street.  
C. CHURCHILL & Co., Ltd.,  
9, Wellington Street.

### BIRMINGHAM.

BUCK & HICKMAN, Ltd.,  
191, Corporation Street.  
C. CHURCHILL & Co., Ltd., Albert Street.  
R. LLOYD & Co., Steelhouse Lane.

### MANCHESTER.

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Guardian Buildings, Cross Street.  
C. CHURCHILL & Co., Ltd.,  
2, Charlotte Street, Mosley Street.

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CAMMELL LAIRD & Co., Ltd., Cyclops Works.

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King Street and Cross Street.

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### STOCKHOLM.

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### VIENNA.

SCHUCHMAYER & SCHUTTLER, Postgasse, 17.

### MILAN.

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Via Tommaso Grossi, 3.

### NEW YORK.

HERBERT TAYLOR, 82, Centre Street.

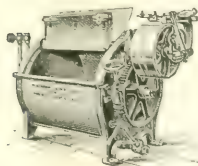
AND THE MAKERS,

# The Coventry Ordnance Works Limited,

COVENTRY.

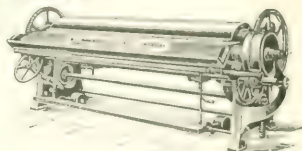


**PAGE'S WEEKLY** Machine Tools, &c.



# LAUNDRY

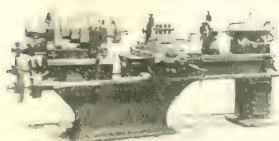
**MACHINERY**  
and Steam **COOKING APPARATUS.**



Please write for our New Catalogue, **N.**

**Summerscales, Ltd.,** KEIGHLEY, ENGLAND.

## HIGH-CLASS LATHES & RADIAL DRILLS.



Write for our Lists.

Telegrams:  
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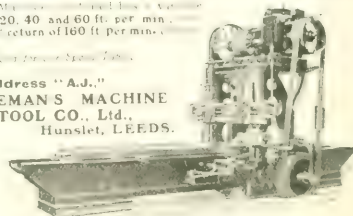
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## BATEMAN THREE-SPEED PLANERS

Planers: May be set to cut long or short  
cut of 20, 40 and 60 ft. per min.  
and return of 100 ft. per min.

Speeds: 20, 40 and 60 ft. per min.

Address "A.J."  
**BATEMAN'S MACHINE**  
**TOOL CO., Ltd.,**  
Hunslet, LEEDS.

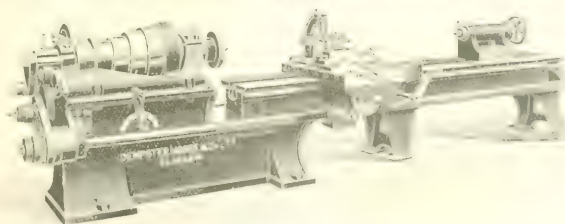


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**ENGINEERS, GLASGOW.**

**Modern Machine Tools of all Kinds.**

**SPECIALITY LATHES FOR HIGH-SPEED CUTTING.**

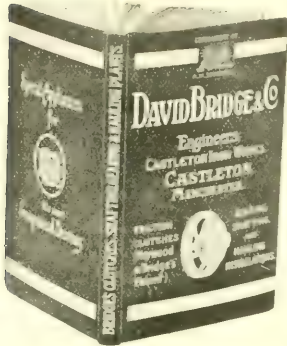


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# PAGE'S WEEKLY

Gearing, &c.

Heywood and Bridge's  
PATENT FRICTION CLUTCHES,  
GEARING & HAULING PLANTS.



Specify our  
Clutches and  
you will not  
regret it

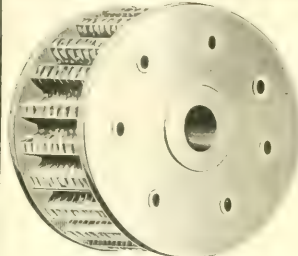
200 PAGE  
BOOKLET  
FREE  
on application.

It will tell  
you all about  
our Clutches  
and Gears

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Castleton Ironworks, ROCHDALE, Lancs.

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**W. L. DIXON & CO.,** 60 Percival St.,  
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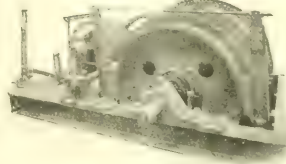


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MOST DURABLE,  
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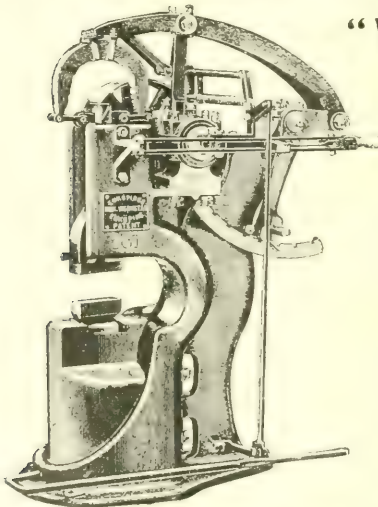
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**Electric Hauling GEARS**



Main and  
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Main Rope,  
Endless  
Rope,  
and  
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Hoisting,  
and Hauling  
Gears.

**M. B. WILD & CO.,** ARGYLE STREET,  
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## THE .. "VULKANUS" Spring Power Hammer.

*The most practical, easily managed, adaptable, and  
durable spring power hammer in existence.*

*The "Vulkanus" forges fast and well.*

*It can be used both for heavy and small forgings.*

*It is very suitable for welding.*

*It is easy to erect and easy to manage.*

*Takes up but little room.*

*Great striking-power in connection with little motive  
power.*

**HUNDREDS IN USE.**

**Aktiebolaget B. A. HJORTH & Co.,** STOCKHOLM,  
Sweden.





# EMPLOYERS OF LABOUR

Can save at least **5°**. ON THEIR WAGES  
BILL, and thousands of employers do so by  
the use of the

## “Dey” Time Registers

which are automatic machines for registering the hour and minute at  
which Employees start and finish work.

and, with the New Attachment provides, in addition to the weekly  
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The “DEY” combines in **THE ONE MACHINE** the  
points of all other Automatic Time Recorders on the market.

They are of British Manufacture Throughout.

They are absolutely the best Time Recorders in the World.

They are the cheapest up-to-date machine on the market.

They are guaranteed perfect in every detail.

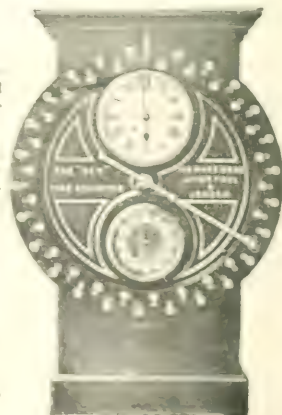
### THEY COMPEL PUNCTUALITY.

The “Dey” time and wages sheets combined do away  
with time books, wages books, and save 90% of clerical  
work. They are adaptable to every requirement, no matter  
how complicated.

A firm using 15 machines writes :  
“The toughest of usage together with the maximum of vibration and roughest of shocks  
when it goes to you for repairs, it will be the first time it has been in the infirmary.”

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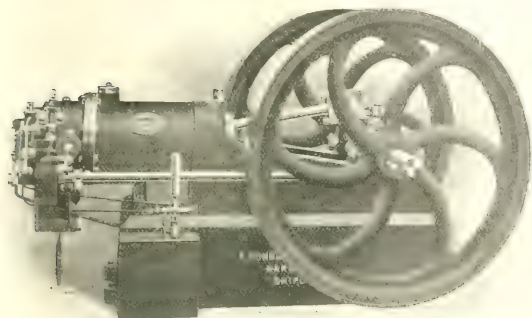
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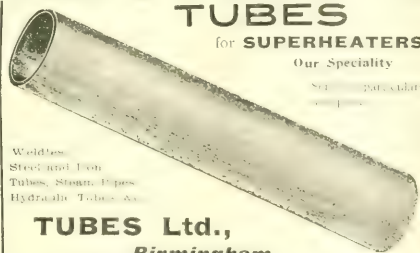
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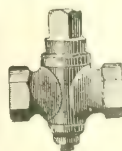


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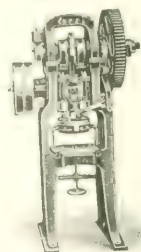
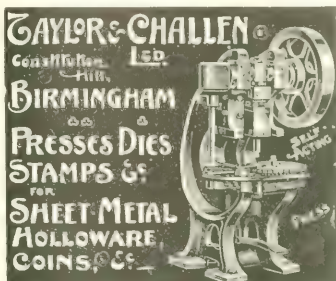
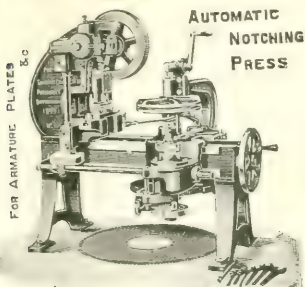
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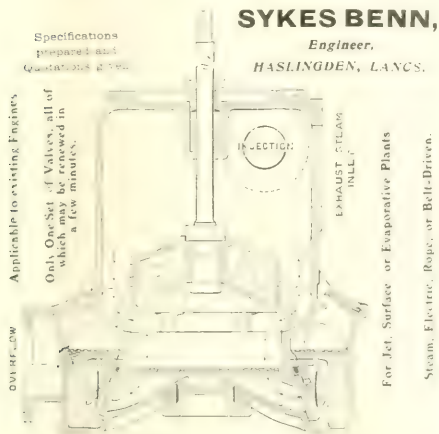
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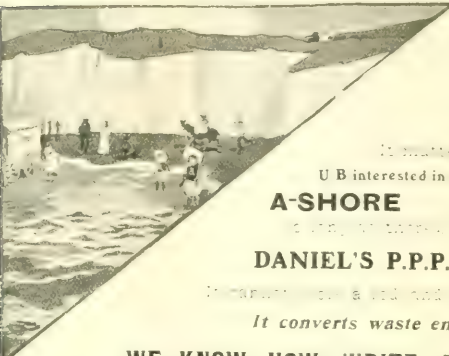

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DAVIDGE PAGE, F.C.S., F.G.S., M.I.M.E., &c.

VOL. VIII.

LONDON, FRIDAY, MARCH 23, 1906.

No. 80.

## THE OFFICES OF "PAGE'S WEEKLY,"

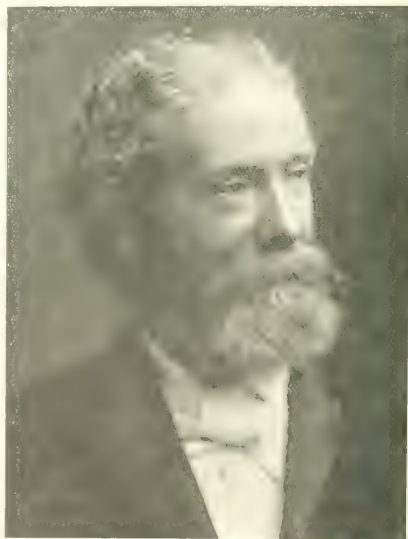
Wednesday, March 22, 1906.

THE Colonial Conference which was to have been held this year, having been postponed until next year, a breathing space will be afforded, enabling Colonial representatives and others to perfect the machinery of the proposed gathering, and lay the foundations of substantial work. Such gatherings may, and it is to be hoped will be, in a secondary degree, pleasant holidays for Colonial statesmen, but primarily they are expected to bring about Imperial organisation, and if this is to be effected by Colonial conferences, it can only be with the aid of efficient "spade work." In other words, there must be a very careful predetermination of aims, and a thorough collation of facts and figures bearing upon the questions to be discussed. That there is much to be done in the shape of Imperial organisation from a business point of view alone is unquestionable. How much the next conference will undertake is another matter. Mr. Geoffrey Drage, discussing this question last week, in an admirable paper before the Society of Arts, gave in his abstract of contents a series of questions, the very magnitude of which is calculated to give pause to the most enthusiastic reformer. But where there are so many anomalies and grievances to be attacked a start must be made somewhere, and Mr. Drage's paper is welcome because it furthers this end.

Passing over the details given of Sir F. Pollock's Committee and its proposed Imperial organisation, its Imperial Advisory Council, and intelligence department for the civil affairs of the Empire, and Imperial Commission for special inquiries—proposals

we are led by the author to a consideration of the various matters affecting the commercial world, which call for uniformity of legislation and administration. Some of them do not directly concern us; others we have ourselves dealt with from time to time. We do them with respect, Mr. Drage says, hard thinking, more method, and more system.

Our patent regulations are still far from perfect. Mr. Drage has upon the subject. In a community



Independent cover of others, and the activities of its citizens, it is a grave anomaly that to secure an invention throughout the King's dominions it is necessary to take out not one, but at least twenty-eight patents, and, whereas a patent good for the whole of the United States costs £20, a patent good for the United Kingdom costs £100, and for the whole Empire from £500 to £600. In Canada a patent must be worked in two years, whereas in other parts of the Empire no such condition exists."

"It is the same with the law affecting trade marks. We have indeed at last in 1905 amended the law as to the registration and protection of trade marks, though the rules issued thereunder by the Board of Trade appear to require attention. But the law in the United Kingdom and the law in British India is different, and the law in the West Indies is different again. Indeed, Barbados and Jamaica possess different regulations. What is wanted is an Imperial definition of a trade mark, a similar system of law and practice with regard to registration throughout the Empire, and some cheap and simple method of extending the protection of any mark registered in any one part of the Empire to the whole Empire. At present to protect a trade mark throughout the Empire, between 30 and 40 registrations must be effected, five in South Africa alone, and, it is needless to add, the process is always more or less costly. The recent amendment of the English law brings out more clearly the divergence of English from Colonial law, but, on the other hand, an attempt has been made in the Commonwealth of Australia to consolidate the existing law of the different States on the lines of the Act of 1905, a movement in the right direction which is worthy of record." Several minor grievances suffered by commercial men from local legislation are incidentally discussed, such as Quebec's tax on commercial travellers.

In the administrative field the author points out that "there is still a great deal to be done in reforming the methods by which information of value to business men is collected and disseminated. The recently published British Empire census, is a

step in the right direction. There is still an immense amount to be done in the way of organisation of information. A Committee of the British Association pointed out in a report published last autumn (1) the desirability of a common statistical method within the British Empire, and the interchange of views with the object of reaching a common method of classification, estimation of value and record of the origin and destination of goods: (2) the desirability of publishing an annual report on the trade of the Empire on a scale sufficiently large to present in considerable detail the trade of the King's dominions beyond the seas: (3) the desirability of extending the uniformity attained in Australia by the publication of the year-book of the trade of the Australian Commonwealth, and in Canada by the statistical year-book of Canada, and the report of the Canadian Department of Trade and Commerce. There is at present no year-book on the trade of the South African Customs Union, and in the West Indies there is need of closer customs relations, and the issue of a joint annual report. A common system should obtain in India, the Straits Settlements, and the other Asiatic possessions of Great Britain. It should be added that the information as to the Crown Colonies is very deficient and lacking in uniformity: (4) the importance of a preliminary lesson being prefixed to the statistical scheme of each colony, explaining the system of valuation, of registration of origin and destination, inclusive and exclusive of transhipment and transit trade, bullion and specie, bunker coal, etc., and affording other comments to assist the proper interpretation of statistics: (5) the importance that both for obtaining a more reliable criterion of trade and production of each colony, and for the establishment of satisfactory comparisons as to the productive power of the several States of the Empire, import and export statistics should be supplemented by a system of figures showing the internal trade and production of each colony; (6) the importance of establishing a common statistical year.

"Something analogous to the consular service should be established in the Colonies. At the pre-

and that it is not a matter of course that the British Government should be responsible for the benefit of the British exporter, while there are no less than 180 consular and trade agents of various ranks, appointed by the United States Government, scattered through Canada, reporting to Washington regularly on every conceivable topic of commercial information. These reports are promptly printed in the United States Daily Consular and Trade Reports, and distributed by mail free (by thousands) in every State of the Union. The Canadian market is laid bare to the American exporter. Every opportunity is made known to him. Should the United States exporter have a question upon any commercial matter, anywhere in Canada, he has some one on the spot to whom he can write, paid to do his bidding." Mr. Drage expresses the belief that "cheap postal and telegraphic services will do more for the unification of the Empire than any other single thing. Cheap telegrams will ensure that in every morning paper in our colonies and dependencies there will be full accounts of the topics which are interesting people at home and *vice-versa*. As to telegrams, there are at this moment many anomalies. For instance, a cable to Havana costs 1s. 6d. a word, to Trinidad 5s. 1d. a word, and to Demerara 7s. a word. Cheap postal rates for letters mean the maintenance of regular communication between colonists, however poor, and their people at home. Cheap postal rates for newspapers and periodicals means the introduction, for instance into Canada, of English journals and reviews which cannot now compete with American periodicals."

The Right Hon. Alfred Lyttelton, K.C., was in the chair at this meeting. In opening the discussion, he remarked that Colonial Prime Ministers might come at any time of the year, and would be welcome, even in July or August, but the preparation for the meeting should be thorough, so that the ground might be completely scouted before they arrived. People had omitted to recognise that that was done, so far as possible at any rate, before the last Conference, by the Colonial Office itself. Months and

in preparing the subjects; but there was the difference between the Imperial Government and the Colonial Governments in such matters, that the latter had not the opportunity or the men who had time to spare for the preparation of the subjects before they came.

The great difficulty in all the Colonies was to get numbers of men of sufficient leisure to be able to attend to public affairs at all, and those who did attend were very much engrossed with the business of their own country, in connection with which they had not the enormous assistance of the permanent departments which assisted English Ministers, and were such a support and guide to them. Now that Conferences were to be summoned every four years, they became definitely systematised and periodicity was established: that seemed to be the first step to be taken, and that was established in 1902. The next step which seemed to him desirable was that preparation should be made before those Conferences took place, extending if possible over some years preceding the Conference. The question was, how that preparation was to be organised. Very delicate and sensitive questions had to be considered in reference to the matter.

He hoped that on the Commission which he referred to in his despatch—and which he hoped would be established—there would be not only representatives of the Colonial Office, the Board of Trade, the Foreign Office, and the India Office, but that the Secretary upon whom much would fall would be able to summon to the assistance of the Commission various persons known to be, though perhaps only in a quiet way, great experts upon the subjects on which they had been engaged, besides men of greater notoriety, who had made a name in public affairs. He did not believe there would be very much difficulty in getting together such a Permanent Committee which might devote itself to the labours which had been indicated by Mr. Drage; but would it be possible to get recommendations of such a committee accepted by, and made acceptable to the Colonies? He imagined there would be a difficulty in that,



to sit on the Commission. If Colonial representatives could be obtained, naturally information of the most important kind would be obtained, which even the most skilful and experienced person in this country could hardly otherwise have access to. But it was no good blinking at the fact that it was difficult to get such men from the Colonies. The Colonies had not many such men to spare, and they were sensitive about being represented by anyone to whom anything like a free hand was given. Constant reference home had to be made by the distinguished colonists who sat on such committees in England, and the machine thus moved with a good deal of slowness and a certain amount of friction. It was no good blinding themselves to such matters; they were almost inevitable, but he did not think that need deter them for a moment from pursuing the course which had, on the whole, been received so well. He imagined that, at any rate, certain distinguished colonists would be able to sit on these committees, and he felt sure that if the Commission digested the information they had obtained, placed it in a good summarised form, and made it accessible to the Colonial and British Ministers before the Colonial Conference took place, then those Colonial Conferences must necessarily be of a more business-like character than they had hitherto been.

Sir Frederick Pollock, Bart., stated in his own way the main points of the scheme. In the first place, he said, there was the Imperial Council or Conference, which in fact would be the existing Colonial Conference, made a business conference, and if necessary reinforced by representatives of other parts of the Empire. The Conference would continue under the proposed plan to be a small and confidential body of between a dozen and twenty members—he hoped not more, because the experience of people who had served on committees was that a committee of more than a dozen was unhandy, and that any large further increase made real confidential and business-like discussion impossible. The secretary of the proposed larger Imperial Commission would also be the permanent secretary of the Conference—a very important point. The Secretary's business would be to keep continuous records of the work of the Conference, and to prepare agendas for its meetings.

He then mentioned the Imperial Council or Conference and its permanent staff what had been called an Imperial Commission. He did not know hether that might ultimately be found the best name for it, but at any rate it would be quite a different body from the Conference itself, although it would conceivably contain some of the same people. I would not be a small confidential advising Council, but rather a large body of persons especially qualified by experience in the various matters to be brought forward. It would be the business of the permanent secretary of the Conference to suggest to right members of that body, and to form it into either standing or temporary committees to examine and report upon particular questions. The Commission would of course be a permanent body, and would act as a whole; it would be a sort of reserve body which could be called upon in sections as wanted.

An instructive little brochure, entitled "Hints to Inventors," by Sir John Lubbock, Bart., M.P., High Steward, and should be read by all who have misconceptions on the part of inventors, who are sometimes, it must be admitted, deficient in ordinary business acumen. One point brought out strikingly is that it is the most trivial idea that often brings in a large return. Another is the danger involved in delaying the perfection of an idea. As the author justly remarks (and history has often proved), "it is quite possible for two people to hit upon the same idea independently." He calls attention to the significant fact that during one day there were one hundred applications for patents on each of the following subjects: Air and gas engines, motor bicycles, gas and lamp burners, stoves and furnaces and kilns, electric switches, electric lamps, dynamos, steam engines, boats, building appliances, furniture, railway vehicles, metal cutting machines, regulation and distribution of electricity, and scores of others, then adding, "On another day there have been on an average of over a dozen suggestions for patents every week, in each of those popular subjects of invention." Thus, until an invention is protected, it is in the public domain, and the probability of the invention being foreclosed. During the year the number of patents granted exceeded 10,000.

### Personal Pars.

of the Institution of Mechanical Engineers, although it was not until 1900 that Mr. Moir, who has been the honorary treasurer of the institution for over twenty years, has just vacated his office, and it was wishes of the institution he had served for so long. Mr. Moir, who was a member of the institution since 1861, was a member of the institution since 1861, and was a member of the institution since 1861. With this gift was associated a vote of thanks for services rendered, which suggested something more than a formal expression of opinion.

Mr. W. JESSON, manager and engineer of the Chatham and District Light Railway Company, has been presented by the employees of the company with a suitable testimonial on the occasion of his silver wedding.

CONTENTS.

100, Abchurch Lane, SINGAPORE 100  
100, Abchurch Lane, SINGAPORE 100

## News Items.

Sir John Lubbock presided at the Technical meeting of the Society of Arts on Wednesday evening, when Mr. Richard B. Kely, of London, reported on the subject of motor boats. The author said that it was not until the end of the year 1902 that British and Continental manufacturers began to turn their attention to motor boat construction. The manufacturers possessed little or no experience of marine work, and were evidently of opinion that it was only necessary to put an automobile engine into a hull in order to produce a successful marine boat. It was speedily recognised, however, that special methods of construction would have to be employed if the internal combustion engine was to be satisfactorily adapted for marine propulsion. Eminent engineering firms then began to turn their attention seriously to the industry. The author traced the development of the internal combustion engine to marine purposes, and the means adopted for employing ordinary kerosene and even the heavier oils as fuel for these engines. He showed by comparison of a 20-h.p. Thornycroft internal combustion engine with a 20-h.p. double-acting condensing steam engine and boiler, the great advantage possessed by the former in the matter of weight, 5 cwt. against 3 tons 3 cwt. Messrs. Yarrow's had recently, he pointed out, demonstrated the possibilities of the internal combustion engine in connection with torpedo boats. An interesting discussion followed the reading of the paper.

Charing Cross Railway Station has been reopened for traffic, a full service being carried on with the exception of a few trains. The working of the station will not be interrupted, as the new roof is being erected from a huge staging, weighing 450 tons, in the construction of which 25,000 cubic feet of timber have been used. This stage is movable on wheels running on rails, and is shifted by means of steam winches. A portion of the old roof is taken down, a temporary wooden roof, covered with zinc, is erected over the platform, and the stage is then moved to another bay. The contractors for the work are Messrs. Handyside and Co., of Derby. The directors have not decided upon the method of lighting the new station. They are making extensive experiments with the latest devices in electric lighting and gas lighting, and after their conclusion tenders will be invited.

Arrangements have been made to hold a joint meeting of members of the American Institute of Mining Engineers, and of the Iron and Steel Institute, in London during the week commencing July 23rd, 1906. The Lord Mayor of London has kindly consented to act as Chairman of the London Reception Committee, and a varied programme of entertainments, visits, and excursions will be provided. The week following, visits, conferences, and lectures will be arranged for the districts.

The British Electric Cable Company have decided to remove their head offices and works to Birmingham and London offices. After the 1st inst. all communications should be addressed to Salop Street Works, Highbury, Birmingham. Their London show-rooms are at 10, Finsbury House, London, E.C. 2.

## Correspondence.

57, Gracechurch Street, London, E.C. 3.

### The Colliery Disaster in France.

to the Editor of PAGE'S WEEKLY.

SIR,—The Salvage Corps which was sent by the Hibernia Mine in Westphalia has clearly proved the importance of having suitable rescue apparatus kept in readiness for immediate use at all mines in cases of emergency. The apparatus which has been used on this occasion is the well-known Giesberg type, also known in this country as the "Evertrusty," and consists of an oxygen cylinder, combined with helmet and respirator bag. It enables men to remain in poisonous atmospheres, such as after-damp, for two hours. Many valuable lives could in all probability have been saved at Courrières had this apparatus been available immediately after the explosion.

It would be well if British mine owners would take the lesson to heart and arrange to avoid the delay of three days which occurred in the instance of the French mine before men properly equipped with rescue apparatus were set to work.

Several of the Continental countries have made the adoption of such apparatus compulsory, and experience has proved the benefit of such legislation.

I, C. H. W. A.I.M.E.

## Obituary.

MR. HENRY DEKENSON MASON, of the late of Messrs. Marshall, Sons and Co., Ltd., engineers and machinists, of Gainsborough, whose death occurred on the 8th inst., was a member of the council of the Institution of Mechanical Engineers. He was also prominently connected with the Agricultural Engineers' Association, and was a member of the executive board of the Engineering Employers' Federation.

MR. ROBERT RAWSON, J.P., died on Sunday at Havant, near Portsmouth, in his 92nd year. In 1847 he was appointed headmaster of Portsmouth Dockyard Schools, and filled that post for many years. Among his old pupils were Sir Philip Watts, Sir William White, and other old Dockyard School boys who have won prominence as naval architects.

## Latest Wills.

BROOKS, Obituary, 57, Gracechurch Street, S.W., and of Silverton, Belvedere Drive, Wimbledon, S.W., formerly hydraulic engineer to the South African Government.

CROOK, THOMAS DAVISON, of Walsley, 24, Lands Terrace, Middlesbrough, assistant Borough engineer and surveyor of the Middlesbrough Corporation.

HARRIS, THOMAS, of Walsley, 24, Lands Terrace, Crook, Durham, for over 50 years connected with Messrs. Pease and Partners in the Crook district; many years in the Middlesbrough district.

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# Technical Institution News.

## Large Locomotive Boilers.

A discussion on Mr. Churchward's paper on this subject was concluded at the Institution of Mechanical Engineers on Friday last. Mr. De Witt Halpin said that with regard to storage heating, he thought he was justified in saying that a greater saving than 1 per cent, the figure quoted as attained on the Lancashire and Yorkshire Railway, could be achieved, and in tests with which he himself had been associated the saving had come to over 20 per cent. Mr. Wright, a Great Western official, said that the locomotive engineer had been doing his best to design and construct, in the most economical way, a boiler for high pressures. There were two points to be borne in mind in that connection—the water and coal used. Since the introduction on the Great Western of water softening plant, they had had less trouble with their boilers. Mr. Vaughan Pender said he had been an advocate of big boilers for 25 years, and Mr. Churchward's paper was an admirable contribution to the literature of the question. On the subject of compounding, he said that he had been successful at slow speeds. With regard to feed water, he could not understand why in this country some means were not adopted for introducing the feed water into the steam space.

## English and American Practice.

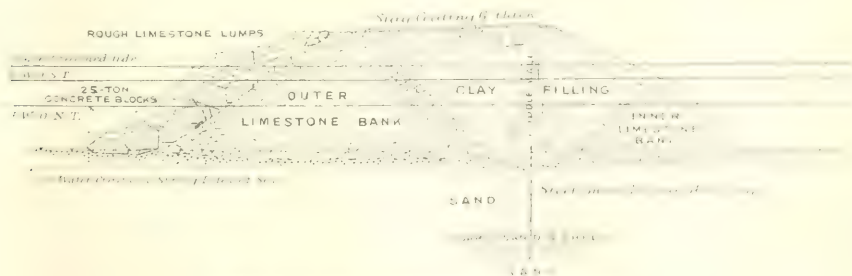
Mr. Churchward was asked, "Does it say that since Mr. Whale had been the locomotive superintendent the London and North-Western had adopted the plain simple engine with a rather old-fashioned type of boiler and deep fire-box, and done away altogether with compounding." The pressure had been reduced to 175 lb. per square inch, and there was no doubt whatever that the reduction in pressure had had an enormous effect in limiting the amount of work which had to be done in the repairing shops, as they did not have the same trouble as formerly with either stays or tubes. Mr. L. H. Fry referred to American experience with large boilers. Boilers had been built in America which had 200 sq. ft. of heating surface, and others were being constructed for the Great Northern Railway of America with

said that storage heating was unnecessary with large boilers, as this could be done in the boiler itself. He was making experiments as to feeding water into the steam space and trying to devise a practical method by which the water could be fed through the steam without touching the water in the boiler.

## London County Council Passenger Steamers.

"The London County Council Passenger Steamers" formed the title of a paper read at the last meeting of the North-East Coast Institution of Engineers and Shipbuilders, at Newcastle-on-Tyne, by Mr. Archibald Hogg. He said shipbuilders were not given a free hand in designing suitable and economical steamers for the Thames traffic; the London County Council practically fixed the design and dimensions of the steamers, and the duty of the builders was performed when they produced the hull and machinery to the sizes given, and had proved that the stipulated speed could be obtained. The conditions to be fulfilled by the steamers, as fixed by the County Council, were verging on the impossible, and all shipbuilders knew what that meant as regarded the first cost, and the cost of running the steamers.

The Council's steamers were designed with too great a speed on the specified length of vessel and draught of water. He suggested as an alternative type a steamer 90 ft. long, 13 ft. beam, and 5 ft. deep, with one deck only for passengers, except in the way of saloon. She would carry 150 passengers at 12 miles an hour, with about 75 indicated horse-power on a draught of water of 2 ft. 10 in., the deck area allowing for a maximum of about 200 passengers. It was probable that while employing the same number of boats, they would carry on an average as many passengers as the present boats do. Thirty of these steamers would cost about £95,000 less than the present ones; the other expenses, including insurance, would be correspondingly reduced, and the cost of upkeep repairs would be greatly cur-



## The Outer Barrier, Hodbarrow.

A PAPER, read before the Institution of Civil Engineers, on the "Outer Barrier, Hodbarrow Iron Mines, Millom, Cumberland," by H. S. Bidwell, M.Inst.C.E. The large sea-

constructed for the protection of the hematite iron-ore mines of the Hodbarrow Mining Company, at Millom, Cumberland. The author gives a short account of the Hodbarrow Mines, their geographical position, early working, and subsequent development; of the measures adopted from time to time for protection against the inroads of the sea; and of the events which led to the design and construction of the latest defence-work, which was begun in April, 1900, and completed in June, 1905. The object of the outer barrier is the reclamation of a large area of ore-bearing ground which was covered by the sea at high water, and also the prevention of the percolation of sea-water into the mines. The area re-

The barrier has the form of an arc, and is 1 mile 530

extreme width of 210 feet at its base and 83 feet at the top. It consists of a main outerbank of rough limestone, protected against the stroke of the sea for the greater portion of its length by a facing of irregularly deposited concrete blocks, each weighing 25 tons, an inner and smaller bank of the same material, and a filling of clay between these two banks; while to guard against percolation of water beneath the barrier a water-tight cut-off is provided below the surface of the foreshore under the main outerbankment. Of this cut-off, 345 yards is ramped in a puddled trench, 400 yards by grooved and tongued pitch-pine sheet-piling, and 1,545 yards by steel sheet-piling. At the centre of the barrier are four sluiceways, constructed of concrete, for the discharge of water and any effluent in the reclaimed area.

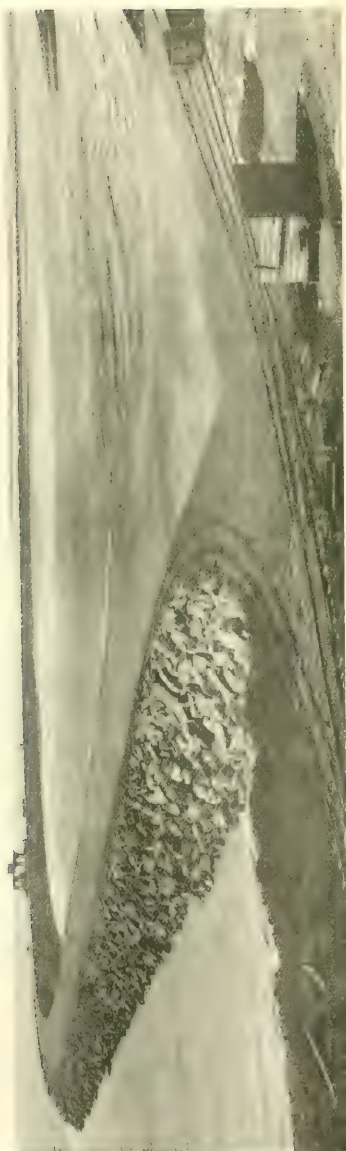
The paper describes the preliminary operations that were undertaken, the procedure during construction, and the results that were achieved, and also gives a number of particulars of the various operations. Particulars are given of the steel sheet-piling, of which particulars are given as to the design, arrangements for driving, and methods adopted for editing the work, with records of results.

Particulars are given of the quarrying of the limestone for the embankment, and of the methods of depositing this material and the clay hearting in the work; also of the preparation and placing in position of the concrete wave-breaker blocks. The construction of the sluice-culverts and their machinery is described in detail, with an account of additional protective measures which were adopted at this part of the work owing to the exceptionally bad ground encountered in the foundations.

The final exclusion of the sea from the area to be reclaimed was accomplished by means of a temporary timber dam. This structure was 422 feet in total length, its ends being enclosed to the extent of 83 feet in the temporary extremities of the embankment. In it were thirty-six sluices, each 6 feet by 4 feet 4 inches. Practically the whole of this structure was, after the exclusion of the water, enclosed in the embankment.

The paper concludes with the description of certain additional protective measures which were carried out after the closing of the barrier.

Mr. Bidwell acted as resident engineer during the



VIEW OF OUTER BARRIER, MILLOM.

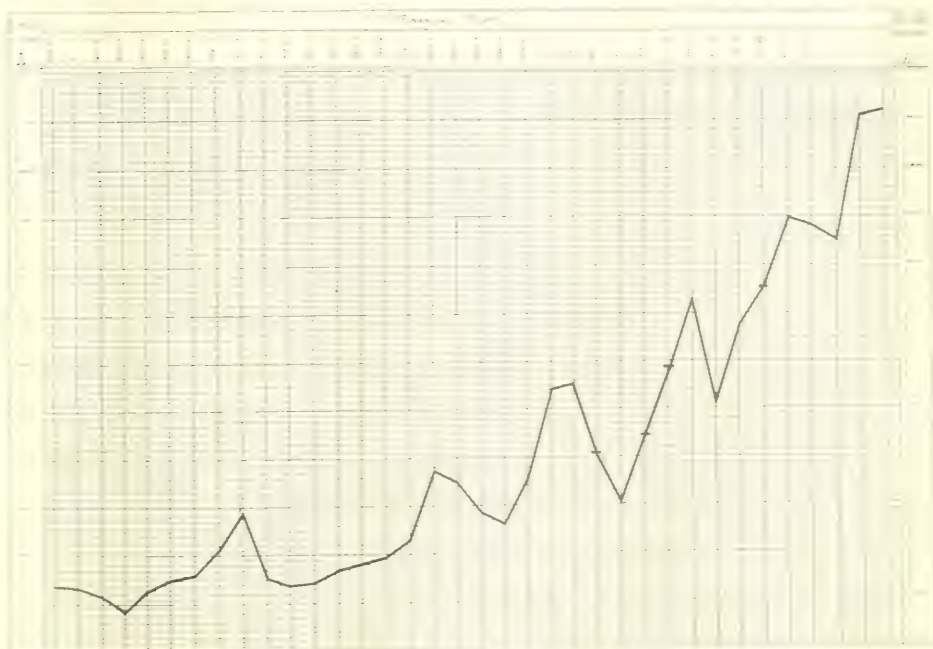
## Requirements of Marine Motors.

The British Motor Boat Club, on the "Requirements of Marine Motors in Design and Construction," expressed his conviction that internal combustion motor design was far from reaching finality, and was not even becoming consolidated. Considering the subject from the point of view of efficiency, he thought that for racing purposes only, the light high-speed motor was essential, because weight saving had to be considered first of all, and the propeller of the almost flat-bottomed racer had to be of small diameter, which meant turning it at a high speed. This would probably mean extravagant consumption per horse-power hour; but that was not the criterion of the suitability of the motor so much as mileage per gallon. He considered, in any case, that all considerations must start at the propeller, although they worked round in a circle through motor and hull design. Under the special circumstances, and seeing that the possibilities of propeller design limited the shaft speed, he thought the thing to do was to use the lightest and most compact motor that furnished an adequate amount of power. With two exceptions, one of which was the new Koll-Champly "Victoria" motor, Mr. de Holden Stone doubted whether the two-stroke type of motor was going to help much to save weight or space. For small powers he

considered the most reliable prospect for serious saving of weight per horse power and space, without sacrificing strength, lay in the direction of the duplex single-acting types, such as the Boudreaux-Verdet Quadruplex and Biduplex motors, or the double-acting type, such as the new Constantine. All these were four-stroke motors.

## Important Points in Design.

and he believed in designing a marine motor with a large and roomy crank chamber. Making the cylinder heads separate facilitated repairs, etc., in a marine motor. Half the troubles from overheating arose from insufficient water space about the heads. The diagonal valves of the F.I.A.T. racing motor represented good practice, but he advocated their being operated from an overhead cam-shaft, as was done in two American motors, the Welch and Ariel. With regard to lubrication arrangements he did not believe in the unreliable gravity feed with its tendency to air lock, and advocated an oil pump working in ratio with the motor speed. He had ceased to believe in outside carburation, and considered that the best place to make the mixture was inside the cylinders at some period during the induction or compression strokes.



NAVY AND MARINE ENGINEERING, Vol. 1, No. 1, 1911, p. 10.



# Naval Notes.

THE *Imperator* is the first of a class of battleships which in America has been built to appear on draft should receive a proper trial at the hands of the authorities. The type is diametrically opposite to the submarines now under construction for the U.S. Navy, but the extensive orders given by Russia for Lake boats may induce the authorities not only in America, but also in Europe, to make a thorough investigation of its merits. At Newport (submarine) is described as the "cruiser type" has been lately completed, and if the inventor is able to carry out his alleged intention of taking the vessel across the Atlantic under her own power, she will have made a very effective demonstration on her own behalf. It is generally understood at the shipyard that the boat is intended for the Russian Navy.

In view of the vast amount of work done by the Japanese Navy to equip the new battleships which are being constructed for the Japanese Government, it is of interest to recall the fact that the Japanese fleet is even now largely of British production. The following vessels have been sent out previously from this country:—

BATTLESHIPS.	BUILDERS.	ARMY.	ARMY.
<i>Mikasa</i> ....	Barrow ....	Elswick .....	Krupp .....
<i>Tsushima</i> ....	Clydebank ....	Elswick .....	Hall .....
<i>Sakawake</i> ....	Thames .....	Elswick .....	Harvey .....
<i>Fuji</i> .....	Thames .....	Elswick .....	Hall .....
<b>CRUISERS.</b>			
<i>Asama</i> .....	Elswick .....	Elswick .....	Harvey .....
<i>Tokura</i> .....	Elswick .....	Elswick .....	Harvey .....
<i>Idzumi</i> .....	Elswick .....	Elswick .....	Krupp .....
<i>Isuzu</i> .....	Elswick .....	Elswick .....	Krupp .....
<i>Tsukuba</i> .....	Elswick .....	Elswick .....	Harvey .....
<i>Yamato</i> .....	Clydebank .....	Elswick .....	Hall .....

The two new vessels the *Idzumi*, which is now nearing completion at Newcastle, and the *Katori*, which is almost out of the dockyard hands at Barrow, will not be ready for sea until June. Japan's navy by the close of the year, if we include her own survivors from the war, her captures from Russia, and the vessels she is building in Europe, will be one of the most powerful in the world.

The table on page 633 from the latest naval blue-book Dockyard Expense Accounts shows a glance at expenditure upon new construction during the thirty-six years between 1867 and 1902. During the latter year under this head £3,492,142 was expended upon dockyard-built ships as compared with the programme estimate of £3,086,775, and £7,737,400 was spent upon contract-built ships as compared with an estimated £7,046,784, while on small vessels there was an expenditure of £13,447, as compared with an estimate of £26,620. The expenditure on reconstruction and repairs was £3,331,045, as against £2,280,000 in the estimate, and the grand total for the year, including personnel, material, and contract work, was £17,347,511, as compared with the programme estimate of £7,848,267. Herein we see reflected the wisdom of the new Admiralty policy. In a large number of cases refits of vessels have been either postponed or abandoned altogether. The net saving under this head amounts to £263,820.

Sum.

The *Imperator* is the first of a class of battleships which in America has been built to appear on draft should receive a proper trial at the hands of the authorities. The type is diametrically opposite to the submarines now under construction for the U.S. Navy, but the extensive orders given by Russia for Lake boats may induce the authorities not only in America, but also in Europe, to make a thorough investigation of its merits. At Newport (submarine) is described as the "cruiser type" has been lately completed, and if the inventor is able to carry out his alleged intention of taking the vessel across the Atlantic under her own power, she will have made a very effective demonstration on her own behalf. It is generally understood at the shipyard that the boat is intended for the Russian Navy.

The Admiralty has decided tentatively on the plan of operations which will as far as possible be followed in regard to the merchantmen to be included in the June manoeuvres. The Admiralty has fixed upon Plymouth and Milford Haven as the ports to which the merchantmen outward bound and held up for the purpose of forming a convoy shall be directed to proceed, while the vessels homeward bound will be assembled at Gibraltar. As soon as a convoy of twelve merchantmen has been made up, the ships will be sent forward, steaming in single line ahead under an escort of two or more cruisers, with destroyers scouting in search of the "enemy." Whenever the hostile fleet is sighted the Admiral of the opposing squadron will, after being apprised by wireless telegraphy of the expected attack, hasten to the scene, and the battle, the issue of which will determine the fate of the convoy, will then be waged. If a hostile warship manages to evade the cruisers and scouts, and gets near enough to the convoy to fire a shot, the particular merchantman fired at is to be considered a prize. It is expected that altogether some three hundred merchantmen will be rounded up during the week of the manoeuvres, and be included upon the return cruises.

The German Budget Committee has approved by a large majority the Bill for the amendment of the Navy Law of 1900. By this amendment the fleet employed on foreign service is to be increased by five large cruisers, while a large cruiser is to be added to the reserve fleet. The Government proposal for an increased displacement in the case of a number of new vessels to be built, and for the construction of three large ships, namely, two battleships of 18,000 tons each, and a large cruiser of 15,000 tons, as provided for in the estimates of 1906, was agreed to by the committee against the votes of the Social Democrats.

The German Budget Committee has approved by a large majority the Bill for the amendment of the naval authorities have been carrying on a policy of replacement only, but for the future this is to be changed to one of augmentation, hence the decision to build six new fast battleships. It is interesting to note that the adverse decision of the Minister of Marine on turbine propulsion is not final, and that this question is to be reconsidered by a technical commission.

# Reports from Abroad.

## Continental.

### Shipbuilding in Norway.

See A. L. Herbert, in *Marine* at Christiania. The following particulars of shipbuilding in Norway are given, from which it appears that that country is now seventh on the list of the shipbuilding countries of the world with sixty-four ships of 53,000 tons and 2,000 h.p. These vessels were built chiefly at Nydalen (nine ships of 1,000 tons), Fauske (six ships of 6,000 tons), Frederikstad (eight ships of 7,200 tons), Bergen (six ships of 7,000 tons), Laxevaag (six ships of 7,000 tons), and Brønnøysund (six ships of 8,000 tons). The machinery was made at Moss (6,800 i.h.p.), Bergen (6,700 i.h.p.), Nydalen (6,200 i.h.p.), Fristad (4,200 i.h.p.), and Laxevaag (3,800 i.h.p.). It is added that the number of vessels built in 1905 was the greatest that could be produced in the country, owing to lack of facilities. As it is, a sufficient number of vessels cannot be built for the country's requirements, and in the case of the larger vessels, their construction cannot be undertaken with profit. Prices are said to have been satisfactory.

### Port Construction at Nervi.

The German Consul at Genoa reports the laying of the foundation stone of a new harbour and docks at Nervi. The work is being undertaken by German capital, and will be finished by about the end of August. Its completion is expected to aid considerably the industrial development of Nervi and its neighbourhood.

### Antwerp's New Docks.

The Antwerp port project, the completion of which is expected in 1907, has been long in the air. The crowded state of the river has occasioned considerable inconvenience in shipping circles, both in the obtaining of the necessary accommodation and in the ability to avoid ships fouling one another in their manoeuvres. Though the opening of the new intercalary docks, which is to take place in 1907, will do much to relieve the present overcrowding of ships, it is pointed out that if shipping increases at the rate of the last few years, which is highly probable, the additional space provided by the intercalary docks provided in the port of Antwerp extension scheme will soon prove inadequate. The total area of the docks, when the intercalary docks are completed, will be 1,109,116 square yards, with a depth ranging from 15 ft. 6 in. for the barge docks to 30 ft. of water in the docks allotted to vessels of larger tonnage. The Bill for the new maritime and military works has been passed. These works include the improvement of navigation on the Scheldt, the extension of the sluice in question, Antwerp, and the organisation of a new defensive system for that city.

### German Coal for Egypt.

The *Shipping Gazette* says: An important freight North-country firm of shipowners. It is for carrying 70,000 tons of Westphalian coal from Rotterdam to Alexandria and Port Said over the ensuing year. The transaction affords another illustration of the strenuousness of German competition in the Mediterranean coal trade. At many Mediterranean ports, and notably at Marseilles, Algiers, and Port Said, German coal has of late been much in evidence, and it is not unlikely that this business will be followed by others.

### Manganese Ore Deposits.

It is reported that Messrs. Friedr. Krupp, A. G. Essen-Ruhr have purchased this week the entire mining properties of Prince Solms-Braunfels, situated in the district of Wetzlar-on-Lahn, and comprising large deposits of undeveloped manganese ore. The price paid is M.4,500,000. The firm of Krupp has already put on 600 men to start the opening up of the mines.

### Belgian Iron and Steel.

On May 1st, the output of pig iron in Belgium for the first three months of the year 1905 was 226,702 tons, against 208,783 tons in 1904. The iron and steel markets are irregular. Pig iron is dear, selling at 75 francs at furnace. There is a shortage of iron for the manufacture of pigs, and there is very little iron unsold for the second quarter. Luxembourg is said to make cheaper offers. Blooms are strongly held at 102½ to 104 francs for the third quarter, the second quarter being sold out. Bars are offered at £5 10s. for iron girders at 24 x 8 in.

### An International Competition.

H.M. Consul at Milan has sent particulars of an international competition for a machine for sweeping the streets. This should be so constructed as to collect the mud into a box of a cubic metre in capacity, to work on streets paved with stones, cobbles, or asphalt, and is to be an automobile of

July 31st. There will be awarded a first prize of

### Tin Lead Alloys.

A process of extracting tin from tin-lead alloys has been patented by Mr. C. A. Willer, of Hamburg. The alloy is melted in a reverberatory furnace, and when the molten liquid shows a red glow it is submerged in a small portion of the lead. An oxide mixture con-

# Colonial and Foreign.

## New Steel Mills in Canada.

Messrs. McKinnon and Monro, the railway construction engineers, are now building two mills at Port Arthur and Fort William, in Ontario, which will be the largest in Canada.

## Arica (Bolivia) Railway.

The Chilean Government has accepted the proposals of the Chilean Society for the construction of the Arica-La Paz (Bolivia) Railway. The price agreed upon is £2,250,000, and the works are to be completed in four years.

## Chinese Railway Reform.

The Chinese Board of Commerce has decided to select a gauge to which all future railways in the country shall conform, and with this object the various railways in North and Southern China have been requested to submit detailed reports on the gauges of their railways.

## New Japanese Cable Steamer Equipment.

The cable gear and equipment for the new Japanese cable steamer now being built in Japan, which was supplied by Messrs. Johnson and Phillips, Ltd., has been recently run under steam. The cable gear equipment has two double-cylinder high-pressure engines, 8 in. diameter by 8 in. stroke, which, with steam at 150 lb. pressure, develop 110 h.p. each, making a total of 220 h.p. With this power the gear is capable of lifting against a strain of twenty-five tons. The equipment is of the double combined picking-up and playing-out type, comprising practically two separate engines arranged so that one or either may work either or both machines, the combination effectually providing against the possibility of a total breakdown of the gear.

## New Cordite Factory for Japan.

The Assistant Minister of the Navy states that Messrs. Armstrong and Co. are establishing a branch factory in Japan for the special manufacture of cordite. It may be recollected that when it was originally stated last year that the Elswick firm was in negotiation with the Government for the purpose of opening in Japan, the news was denied.

## Bridges for Soudan Railways.

It is stated that orders for twenty more bridges have been placed with Sir Wm. Arrol and Co., Ltd., in connection with the new branches of the Suakim and Khartoum line. The majority of these bridges will be of over 100 ft. span. It will be remembered that the firm named has already supplied a good deal of material for railway construction undertaken by the Egyptian Government.

## Borneo Manganese Ore Deposits.

The British Borneo Exploration Company has received specimens of manganese ore from a deposit situated close to Taritipan, which lies near the southern end of Marudu Bay, on the north-west coast of British North Borneo. Outcrops of the ore have been met with over an area of about twelve square miles. Reports received state that analyses of samples from various parts of the deposit indicate that average shipments would contain manganese dioxide equivalent to from 49 to 51 per cent. of metallic manganese, 15 per cent. of silica, 0.35 per cent. of sulphur, and 0.03 per cent. of phosphorus. The silica is rather high, but the sulphur and phosphorus decidedly low. A picked cargo would contain 51 per cent. of silica and the equivalent of 51 per cent. of manganese. It is estimated that an annual export of from 40,000 to 50,000 tons could be easily maintained.

# United States.

## Trent Valley Canal Hydraulic Lift Lock.

The lock which has been recently opened is not only the largest of its type in the world, but the only one in existence on the American continent. It is on the Trent Valley Canal, a waterway connecting the Georgian Bay with Lake Ontario. The lock is on a four-mile section of the canal. For the first 3½ miles the canal is formed by short lengths of excavation and natural valleys, till a slope is reached where a difference of elevation of 150 ft. is found in 800 ft. This difference is overcome by the new hydraulic lift lock. The primary constructional element of such locks is a pair of water-tight steel boxes or chambers, closed at the ends by gates, hung, in this instance, on the lower edge. Similar gates close the ends of the reaches. The quantities of material used in the construction of this lock are: Cubic yards of concrete, 26,000; rolled steel in plates and shapes for the lock-chambers and gates, 1,680,000 lb.; cast iron in rams, accumulator, guides, etc., 495,000 lb.; steel castings for main presses and accumulator, 608,000 lb. The total cost of the lock was about \$500,000.

## Dry Docks at the Great Lakes.

Floating dry docks are being built for the accommodation of vessels on the Great Lakes. One to cost \$150,000, for service at Buffalo, is being built at Manitowoc, and another will be built by the same concern, of steel, at a cost of \$200,000, which will accommodate the largest vessels on the lakes.

## Hornsbys' Boilers in America.

The Bigelow Company, one of the well-known boiler-makers of New Haven Conn., U.S.A., have acquired the American rights of the Hornsby upright water-tube boilers, and will manufacture these boilers for the United States.

## Turbines for the Milwaukee Electric Railway and Light Company.

Coincident with the completion of the new terminal station and office building that Mr. John I. Beggs has had constructed for the Milwaukee Electric Railway and Light Company, of which he is president, a contract has recently been placed with Allis-Chalmers Company for the installation of three Allis-Chalmers steam turbine generating units, each of 1,300 k.w., 60 cycle, 3 phase, 2,300 volts, to operate



under steam pressure of 150 pounds. They included in this contract, two 1,500 k.w. motor-generator sets, to deliver direct current at 200 volts, each consisting of a direct current generator direct coupled to a three-phase, 60 cycle synchronous motor. The electrical machinery for this installation is to be constructed at the Bullock Works of the Allis-Chalmers Company in Cincinnati; the turbines will be built in the large West Allis shops.

### Iron Ore Mines in Virginia.

The British Commercial Agent in the United States (Mr. E. Seymour Bell) reports the signing of a lease of 50,000 acres of iron ore property in Potts Creek Valley. The immediate and extensive development of these properties is contemplated. They have been known for some years to contain brown hematite of good quality. Iron ores of a similar nature have been mined for some years in an adjacent district, and their value has been demonstrated. The formation is what is known as Oriskany ore, out of which high-grade iron can be made without mixture with other ores. The ores are not suitable for making Bessemer steel, being too high in phosphorus, but may be adapted to the basic process. Should the properties turn out to be as valuable as is expected it will greatly increase the production of the Virginia iron works, which have had difficulty for some time in securing a sufficient quantity of ore.

### A New Type of Blast Furnace.

Mr. E. P. Mathewson, of Anconia, has patented a new blast furnace, which he claims will produce economy of fuel, labour, and water, will allow treatment of larger quantities of material, will ensure a quick discharge of the molten metal as soon as the latter reaches the bottom of the shaft, and will prevent incrustation at the sides of the shaft. A further object of the invention is to allow the shutting down of one portion of the furnace for repairs without disturbing the remaining portion. The shaft is narrow and long, to accommodate a large shaft at one time. In the bottom of the shaft are arranged a plurality of crucibles. The bottom of the shaft slants towards the crucibles from a point midway between them. Sets of tuyeres are arranged in the side walls of the shaft. The crucibles are provided at the front with spouts and at the rear with tap-holes. At the top of the shaft are a series of gas outlets. The detailed construction of the shaft is similar to the ordinary blast-furnace now in use. A furnace having two crucibles, it is declared, will smelt as much as four ordinary furnaces, thus dispensing with three pairs of end jackets, and effecting a saving in coke, labour, and water.

### American Iron Market.

The Iron Age, in its weekly review, states that the statistical position of pig iron continues in good shape. The production has recently been slightly curtailed, and stocks are declining. The weekly producing capacity of coke and blast furnaces on March 1st amounted to 480,000 tons, against 483,000 tons on February 1st. The production of pig iron by the furnaces of the Steel Trust reached in February 1,217,000 tons, and that of merchant furnaces 677,000 tons, making a total of

an anthracite coal strike does not usually curtail the output of pig iron, and that the loss in the last

regards delivery of pig iron during the third

America. The requirements of structural steel con-

### Where England Beats America.

The American Iron Age, in its weekly review, states that the American coal trade is being controlled virtually the entire coal trade. The attempts to introduce American coal have been abandoned, and it cannot be said that the prospects for its re-introduction are encouraging. The common complaint is to be heard that the American coal requires more careful firing than the Welsh. But in addition to this obstacle is the higher freights which American coal is forced to bear. Vessels from England, both steam and sail, come and go, and are able to bring the coal as well as wool, wheat, etc., and are able to bring the coal as

### The Gayley Dry Air Blast.

Before the American Iron Age, in its weekly review, recently, Mr. C. A. Meissner, of the United States Steel Corporation, has dealt with points arising out of this process. Mr. Meissner is of opinion that modern blast furnaces, equipped with stoves for producing high blast temperatures, have undoubtedly achieved much gain in product and fuel economy, but not enough to equal the gains secured in those respects by drying the blast—gains, in fact, which can be added to those of such previous progress. The advantageous results obtained from the dry blast are not sensibly affected by changes of season. Mr. James Gayley explained that he had not sought the greatest gain through the saving of fuel, but rather through delivering the air to the blowing engine uniform in moisture. Calculations made by three separate authorities had indicated that the greatest fuel economy through avoiding the decomposition of the moisture in the blast in ordinary conditions it might be expected to be 3 per cent. Mr. Gayley referred to one very important modification of the plant for his process, and that is, to conduct the refrigeration in a two-stage apparatus, which would remove from 60 to 70 per cent. of the moisture in the air, and then, after the air has been dried, to calculate that while two-stage refrigeration would

## Launches of the Week.

## Launches of the Week



# Some Uses of Producer Gas.

By A. E. A. Edwards, M.I.Mech.E.

THESE are at the present time a dozen different patent producers used in steel works, and perhaps 50 or 500 used for power purposes. All roads lead to Rome, and whether you use a solid bottom or a water-lute, a bituminous or anthracite, a suction or a pressure, the gas is much the same, and the results will depend much more on the men in charge than on the producer. My experience goes to prove that so far as cleanliness of the gas is concerned it is possible with the plant in good order to obtain gas as free from tar and other impurities injurious to an engine, as town gas, whether anthracite or bituminous fuel is used.

Producer gas has been successfully adapted to the following amongst many other purposes: Firing steam boilers, evaporating pans, iron and steel manufacture, engines, lacquering, hardening steel, jappanning, brazing, brass melting, factory heating, lighting, annealing and reheating muffles for wrought and cast iron, brass, glass, china, and many other purposes, core drying stoves for iron foundries and burning bricks. As regards the first, one of the principal advantages is that the cheapest qualities of fuel may be used. It appears to me that this method ought to be more economical than hand firing with coal.

## Engines.

This gas, used in engines requires for combustion much less air than town gas, and the adjustment of the air regulation requires attention from time to time in order to get the best results. Hence, one of the reasons why makers require so much margin between the guaranteed power for continuous running between town and producer gas.

It is comparatively easy to make a gas engine that will give on certain kinds of producer gas, as large a card as can be obtained from town gas, by sweeping out the products of combustion and introducing clean air at the end of every exhaust stroke, but the additional economy would not be worth the outlay expended in getting in.

Another point I should like to raise with regard to the use of producer gas in engines is the fallacy of considering magneto ignition essential. Magneto ignition is ideal, but when you have been fetched a few times across one or two counties to screw up a nut or repair a broken wire on a magneto gear, you are apt to wonder whether something less ideal may not give sufficiently reliable results. On many engines we have used tube ignition, with a timing valve, of course, and have never found the least difficulty which could really be laid to the account of the ignition gear. We have also tried untimed ignition tubes, but the variation in the quality of the mixture seems to cause great differences in the time of firing, and the running is not satisfactory.

## Brazing.

At a large cycle factory in Coventry where we recently took tests, we found that of the total annual consumption of gas for all purposes, one-ninth was used in brazing pipes, while the enamelling ovens were responsible for one-third of the whole.

Brazing by producer gas necessitates special blow

pipes. It is only waste of time to attempt it with a coal gas blow pipe. An oxygen blow pipe of large size will do, but it is better to have the pipes specially constructed.

Some tests on assorted articles brazed by producer gas and town gas at a chandelier manufactory showed that even with a man inexperienced in the use of the gas, the time occupied with the producer gas was only three minutes longer than for town gas on 42 tests.

Three points are essential for brazing with producer gas—

- (1). Have an ample supply of gas of good quality.
- (2). Use an air pressure of at least 2 lb. to the inch.
- (3). Use a specially constructed blow pipe giving an ample gas way, and an air nozzle with a hole of about  $\frac{1}{8}$  in. diameter.

## Brass Melting.

We have made a number of tests of the time occupied and gas used for brass melting by producer gas, and I have pleasure in tabulating some of the results. We hope to have an installation of this class in ordinary work in a few days.

Metal.	Weight.	Time Melting.	Gas used.	Factor per cwt. of metal.	Remarks.
Copper	14 lb.	45 min.	210 cu. ft.	1.5	21 lb.
Copper	14 " 33 "	"	105 "	1.325	17 "
Brass	34 " 60 "	"	27.2 "	"	21 "
Brass	50 " 104 "	"	98.0 "	2.200	28 " Cold Bath.
Brass	50 " 90 "	"	85.0 "	1.922	24 "

## Factory Heating.

Some time ago Mr. Dowson very kindly invited me to see the system he used for heating the factory of his company at Basingstoke. In a test made by Mr. Dowson, 262,000 cubic feet of air were raised through 81° F. in one hour with 3,150 cubic feet of gas made from 39 lb. of anthracite. The loss of temperature in the air ducts was 7°. The products of combustion left the heater at a temperature of 100° F., carrying with them only about 7 per cent. of the heat of the gas. The total efficiency of the heater Mr. Dowson worked out at about 90 per cent. In the summer fresh air is drawn from outside and delivered all over the building by means of the same fan.

## Lighting.

Producer gas when burnt in connection with an ordinary alko-carbon gas burner produces a very good light with a flat flame burner. The consumption of producer gas is 25 feet per hour. I have not conducted my experiments long enough to tell accurately the consumption of alko-carbon. There is not any doubt that this gas will shortly be used with inverted incandescent gas burners for factory lighting. I have experimented in this way, and find no difficulty in getting a good light, with a burner constructed for the purpose. Of course, with any sort of lighting for interiors, it would be necessary to further purify the gas to get rid of the sulphur, but that requires quite a simple piece of apparatus, which does not want much attention.

### Malleable Ironfounder's Annealing Ovens.

These form one of the simplest installations for regenerative furnace work. Continuous regeneration is all that is required, the air and gas being heated by the incoming gas passing along the flues provided for the incoming air.

I do not think that any regeneration whatever is required for the temperature necessary for annealing iron, and although it is no doubt economical in fuel to regenerate, it is doubtful whether the economy will repay the additional outlay and the much larger amount of repairs. Indeed, in one or two instances brought before our notice, benefit has been derived by getting up all regeneration and by using cold air and hot gas.

With any given draught or blast pressure, cold air mixed with hot gas will give a hotter flame temperature than hot air mixed with the gas. This is easily explained. The heated air is enlarged in bulk, and only a given bulk of air can be introduced in a given time, and consequently the amount of oxygen introduced is reduced, and a longer flame of lower temperature is obtained.

A system of regeneration which I have seen used, but which does not, I think, offer any advantages, is to heat the incoming air and gas by means of the heat of the combustion chamber itself. It appears to me that this is like robbing Peter to pay Paul, for the heat we introduce to the gases before firing them is simply taken out of the heat of the furnace; whereas, the heat for this purpose should, of course, be derived from the waste gases

### Waste of Gas and its Detection.

out with the ashes, or by using too much or too little air, or by using too much or too little fuel, or by using too much or too little technical knowledge. I therefore always advocate that

by someone who can understand what he wants to get from them. In one case a bituminous plant had been running well for some months, we found one month that fuel had gone up from 1.7 lb. per h.p. hour to 2.3 lb.; on inquiry we found that they were troubled with tar, although previously they had had none. On getting rid of the tar, we found the consumption go down again at once to the normal.

In another case an anthracite plant through the usual week's test worked out at 1 lb. fuel per h.p. hour. The next month we found the fuel nearly 2 lb. per h.p. The plant was said to be working well and giving no trouble. An examination of the ashes showed 60 per cent. of carbon poked down and raked out of the water lute. These examples will be sufficient to prove our contention to always test a new plant thoroughly to get a basis of fuel consumption. Any deviation from that afterwards should be rigidly inquired into.

Time	Atmos. pressure	Barometric pressure	Hours run.		Furnace temperature			Furnace pressure	Air pressure	Air flow	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal	Town water	Ashes	Flour	Hours	Furnace	Air	Coal
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producer gas plant. The use of the standard 100 h.p. average load, and only working for 54 hours per week; but if the plant is worked continuously, or if the power is greater, the advantage of using cheap fuel becomes more apparent.

### Cost of Producer Gas Plant.

It is not necessary to state that in estimating the cost of producer gas, as against town gas, due allowance should be made for the extra cost expended on the larger size engine required to deal with producer gas for a given output.

The author gives a detailed estimate of the annual running expenses for an engine of 30 b.h.p. working through the year at an average 7 h.p., but working up to 23 h.p. at times: Town gas, £2.1; producer gas, £2.15. This leaves 5s. to cover rent of space occupied, removal of ashes, and so on, without considering the question of being hung up some morning because the engine attendant is absent, and no one else knows how to run the plant.

An engine of 25 b.h.p. on town gas, with an average working load of 14 b.h.p., rising to 20 h.p. at times: Town gas, at 23 ft. per b.h.p. hour 805,800 ft. at 1s. 6d., £65; producer gas, £55 14s. The balance in favour of the plant, £9 6s., is a sum altogether inadequate to cover the extra trouble, inseparable from the use of producer gas.

The annual running cost of an engine of 30 b.h.p., average load 21, but working up to 35 at times: Town gas, £60; producer gas, £74 10s., leaving a balance of £14. Of course the economy would be greatly increased if the engine were more heavily loaded.

The annual running cost of a 150 h.p. plant, average load 50 h.p., is stated as follows:

Town Gas.	Producer Gas.
at 1s. 6d. 465 0 0	at 1s. 8d. 580 0 0
Wages, 3 men, 300 0 0	Wages, 3 men, 300 0 0
Water at 2 gals. per h.p. hour ... 20 0 0	Water at 2 gals. per h.p. hour ... 20 0 0
Depreciation and repairs ... 75 0 0	Depreciation and repairs ... 75 0 0
Total ... 560 0 0	Total ... 675 0 0

Here is some economy worth considering, but we really cannot see how firms can worry themselves with a small plant of 10 h.p. to 20 h.p. for the paltry economy that there is in it. Indeed, in actual practice it is doubtful whether there is any economy at all, when the additional trouble in the office is taken into account.

Let us now look at a larger plant, and compare the cost of

### Annual Running Cost.

Town Gas.	Producer Gas.
at 1s. 6d. 465 0 0	at 1s. 8d. 580 0 0
Wages at 30s. per h.p. hour ... 75 0 0	Wages at 30s. per h.p. hour ... 75 0 0
Water at 2 gals. per h.p. hour ... 40 0 0	Water at 2 gals. per h.p. hour ... 40 0 0
Depreciation and repairs ... 75 0 0	Depreciation and repairs ... 75 0 0
Total ... 655 0 0	Total ... 770 0 0

It is not worth while to put in bituminous plant for 100 h.p. average load, and only working for 54 hours per week; but if the plant is worked continuously, or if the power is greater, the advantage of using cheap fuel becomes more apparent.

In all cases we have taken the gas at Birmingham Corporation price for engines, but if the gas is used in stoves, mufles, etc., town gas is higher in price, and the margin between the two systems is correspondingly increased.

It is useless to compare larger sized plants with town gas, except under special circumstances, because if town gas is used it is purely because space is of more importance than expense of running.

Take a 500 h.p. bituminous plant which has been at work for twelve months at 400 h.p. average.

	£	s.	d.
Coal 400 h.p. at 2 lb. per h.p. at 8s. per ton 385 0 0	385	0	0
Wages, one man at £2 per week ... 104 0 0	104	0	0
Rent and repairs ... 20 0 0	20	0	0
Water from own sources, say— ... 20 0 0	20	0	0
Oil on plant engine ... 10 0 0	10	0	0
Management expenses ... 30 0 0	30	0	0
Total ... 679 0 0	679	0	0

Of course, the cost of fuel is not the only point to be considered.

I have purposely omitted from all my figures the cost of engines, as that opens up the very large question of comparisons of various systems of power production, which is a subject large enough in itself to form the subject of a book, and which is far beyond and separate apart from the object I have in view at present.

### Some other uses.

My firm is just now engaged in some tests in connection with the use of producer gas engines and plants for the propulsion of vessels, and there is very little doubt that the results will prove satisfactory. Much remains to be done in this direction, however, before the familiar horse is removed from the tow paths of our canals, and the turbines are taken out of our men-of-war. Why should not producer gas be used for motor-cars? It at any rate could not smell worse than some of the abominations we have on the road. There is a field here for engineers to think out, but I, at any rate, have no desire to experiment in this direction at my own expense, and so will leave this part of the subject to others.

There is one other point to be considered, and that is the

### Books Received.

- "Sanitary Engineering." A practical manual of town drainage and sewerage and water supply. By J. H. G. S. and others. London: W. & A. G. S. 1908. Second edition. Charles Griffin and Co., Ltd.
- "The Chemistry of the Materials of Engineering." A handbook for engineering students. By A. H. G. S. and others. London: W. & A. G. S. 1908. Second edition. Charles Griffin and Co., Ltd.
- "Wireless Telegraphy." By G. G. S. and others. London: W. & A. G. S. 1908. Second edition. Charles Griffin and Co., Ltd.



# Employment in the Engineering, Shipbuilding, Iron, Steel, and Tinplate Trades.

Compiled from the Board of Trade Returns for February.

## Engineering Trades.

Employment during February generally continued good, showing a slight improvement on the previous month, and being much better than a year ago.

In nearly every district employment was good, and as compared with the previous month the districts showing the greatest improvement were Belfast and Dublin, the Oldham, Bolton, and Blackburn district, and the East of Scotland. The only districts in which a decline was recorded were the Hull and Lincolnshire district, the West Riding towns, the South Wales and Bristol district, and the Notts, Derby, and Leicester district.

As compared with a year ago, an improvement was shown in every district.

Returns relating to 150,579 members of Trade Unions show that 3.0 per cent. were unemployed at the end of February, as compared with 3.2 per cent. in January, 1935, and 6.4 per cent. in February, 1934.

The percentages for the various districts, as far as they are available, are shown below:—

District	No. of Members of Unions at end of Feb. 1935, included in these returns.*	Percentage returned as Unemployed at end of			Increase (+) or Decrease (-) in percentage unemployed for 1935 as compared with 1934	
		Feb. 1935	Jan. 1935	Feb. 1934	Month 1935	Year ago.
North-East Coast ... ..	14,808	3.0	3.1	5.1	— 0.1	— 2.1
Manchester and Liverpool District ... ..	16,559	3.0	3.1	5.1	— 0.1	— 2.1
Oldham, Bolton, and Blackburn District ... ..	12,111	3.0	3.1	5.1	— 0.1	— 2.1
West Sussex Towns ... ..	12,019	3.0	3.1	5.1	— 0.1	— 2.1
Hull and Lincolnshire District ... ..	1,619	3.1	3.2	4.6	+ 0.1	— 1.5
Essex, Kent, Middlesex, London, Southampton, and Coventry District ... ..	6,841	3.1	3.2	4.6	— 0.1	— 1.5
Notts, Derby, and Leicester District ... ..	10,411	3.1	3.2	4.6	— 0.1	— 1.5
London and South-East District ... ..	10,411	3.1	3.2	4.6	— 0.1	— 1.5
South-West and Bristol District ... ..	6,641	3.1	3.2	4.6	— 0.1	— 1.5
Cardiff and District ... ..	11,721	3.1	3.2	4.6	— 0.1	— 1.5
East of Scotland ... ..	8,559	3.1	3.2	4.6	— 0.1	— 1.5
Edinburgh and Fife ... ..	8,441	3.1	3.2	4.6	— 0.1	— 1.5
Other Districts ... ..	5,011	3.1	3.2	4.6	— 0.1	— 1.5
United Kingdom ... ..	150,579	3.0	3.2	6.4	— 0.2	— 3.4

Employment was good at Oldham, Bolton, Blackburn, Preston, and Burnley. Grinders and glazers, and spindle and flyer makers were well employed, and a considerable amount of overtime was worked throughout Lancashire generally. At Barrow-in-Furness employment remained much the same.

At Leeds employment generally continued fairly good, and showed an improvement with boiler makers and iron foundries. It was fair at Wakefield and improving at Stanningley. At Sheffield and at Rotherham employment generally was fairly good. Core makers and iron and steel dressers were well employed, but boiler makers were slack. At Barnsley it was slack. In the Bradford district engineers and ironfounders were fairly well employed and some overtime was worked. At Huddersfield and Dewsbury employment was fairly good. At Keighley it was good with engineers and moderate with ironfounders. At Halifax it was improving with engineers and iron foundries.

In the Hull and Lincolnshire district employment was fairly good, though there was a slight increase in the percentage of unemployed as compared with the previous month. At Doncaster it was moderate generally.

At Nottingham employment, though still only moderate, improved slightly with general engineers, tool makers, and pattern makers. It was bad with ironfounders, boiler makers and blacksmiths, but good in the lace and hosiery machinery branches. At Derby it was dull with engineers, fair with boiler makers, and good with brass moulders and finishers. At Burton-on-Trent it was quiet with engineers and bad with ironfounders. At Leicester it was good with engineers and tool makers.

At Birmingham, Wolverhampton, and Coventry employment generally was good, and some overtime was worked in the cycle and motor branches.

Employment in the Potteries remained moderate, and there was some short time.

In the Eastern Counties employment remained steady.

Employment in the London district, as shown by Trade Union returns, slightly improved, and was considerably better than in February, 1935.

In the dockyard towns employment remained dull. At Southampton it was fair, and some overtime was worked.

In the South Wales district employment generally was fair, and slightly better than in the previous month. At Bristol, though some improvement was recorded, employment remained slack, and short time was worked by

On the North-East Coast employment was good, and was much better than a year ago.

In Manchester and district employment remained on the whole good. At Liverpool it was generally fair, but dull with brassfounders and hammermen. With engineers

Employment was fair generally at Edinburgh, and with ironfounders at Falkirk, though short time was

At Belfast employment was good generally, and much better than a year ago.

At Barrow-in-Furness it was moderate, and worse than a month ago. At Yarmouth and Lowestoft it was good; at Ipswich, dull; it was good at Cork, bad in the other ports in that district.

### Shipbuilding Trades.

Employment, on the whole, continued to improve, and was considerably better than a year ago.

Branches of Trade Unions with 57,153 members had 3,915 (or 6.9 per cent., the lowest figure since August, 1902) unemployed at the end of February, as compared with 7.9 per cent. at the end of January, and with 11.5 per cent. a year ago.

Compared with a month ago, the most marked improvement, as indicated by the percentages of unemployed, was in the Mersey district and in East Scotland; the greatest decline was in the Bristol Channel Ports.

Compared with a year ago a considerable improvement is shown in most of the great shipbuilding centres.

District.	No. of Members of Unions at end of Feb. 1906 included in the returns.	Percentage unemployed at end of		Increase (+) or Decrease (-) in percentage for	
		Feb. 1906	Jan. 1906	Feb. 1905	Month ago. Year ago.
Tyne and Blyth ... ..	9,594	6.2	6.0	14.8	+ 0.2 - 7.6
Wear ... ..	4,944	2.5	4.2	11.9	- 1.7 - 9.4
Tees and Hartlepool ... ..	5,174	5.5	5.7	10.0	- 1.2 - 1.5
Humber ... ..	2,144	6.5	5.9	10.3	- 0.6 - 5.5
Thames and Medway ... ..	4,787	3.7	10.9	3.4	- 7.2 + 0.3
South Coast ... ..	7,792	7.1	9.5	5.2	- 2.4 + 1.9
Bristol Channel Ports ... ..	12,296	13.5	15.0	12.2	+ 1.5 - 1.1
Mersey ... ..	1,866	5.1	12.0	14.1	- 7.9 - 9.0
Clyde ... ..	12,183	5.5	8.1	10.5	- 2.6 - 3.9
Dundee, Leith, and Aberdeen ... ..	2,529	0.6	1.0	14.7	- 7.5 - 8.1
Other Districts ... ..	2,848	5.2	3.9	17.4	+ 1.3 - 6.2
Other Districts ... ..	3,159	7.3	8.4	6.8	- 1.1 + 0.5
<b>United Kingdom ... ..</b>	<b>57,153</b>	<b>6.9</b>	<b>7.9</b>	<b>11.5</b>	<b>- 1.0 - 4.6</b>

\* Figures for 1905 are estimated; † figures for 1904 are figures.

Employment continued good on the Tyne and Wear on both new and repair work. With sailmakers, however, it was slack. In the Tees and Hartlepool district it was good on new work, but showed a falling off in the repairing branch. On the Humber employment was fairly good, on the whole, but iron shipbuilders reported a decline. Generally speaking, employment on the North-East Coast was considerably better than a year ago.

In the Thames and Medway district employment was slack, but the improvement noted a month ago (chiefly in repair work) was maintained. As compared with a year ago there was little change. At Southampton employment continued fair on ship repairs, and was moderate on yacht work. At other South Coast ports there was a slight improvement on the whole. At Bristol Channel ports an increase in the number of unemployed was reported. On the Mersey employment showed considerable improvement, chiefly on repair work, and was much better than a year ago. Ship joiners, however, reported it as dull.

Employment continued fair on the Clyde, and was rather better than a year ago. At Partick and Govan, however, some slackness was reported. At Leith employment remained bad; at Dundee it was fairly good; at Aberdeen, fair.

### Iron and Steel Works.

Employment at iron and steel works in February was slightly better than in January, and considerably better than a year ago, 8.3 per cent. more workers being employed at the works covered by the returns received.

The total volume of employment (i.e., numbers employed multiplied by the average number of shifts worked) during the week ended February 24th, 1906, at the 197 iron and steel works from which returns were received, was 0.2 per cent. greater than during the week ended January 27th, 1906, and 10.1 per cent. greater than a year ago.

The aggregate number of shifts worked during the week by all the workpeople included in the returns was about 516,500, as compared with 515,500 a month ago, and 490,250 a year ago.

	Number of Workpeople employed at the end of week making returns.		Average Number of shifts worked per man.			
	In week ended Feb. 24th, 1906	Increase (+) or decrease (-) as compared with A month ago. A year ago.	In week ended Feb. 24th, 1906.	Increase (+) or decrease (-) as compared with A month ago. A year ago.		
<b>Departments.</b>						
Open-Hearth Melting Furnaces	3,118	+ 116	+ 556	5.91	+ 0.02	- 3.2
Crucible Furnaces	576	- 17	+ 53	5.05	+ 0.22	- 0.33
Bessemer Converters	1,566	- 181	- 49	4.91	- 0.17	- 0.11
Puddling Furnaces	9,945	- 33	+ 425	5.15	- 0.12	- 0.21
Rolling Mills	30,765	+ 257	+ 1,014	5.12	- 0.05	- 0.78
Forging and Pressing	3,037	- 81	+ 271	5.05	+ 0.01	- 0.16
Foundries	11,517	+ 171	+ 1,274	5.39	- 0.02	+ 0.01
Other Departments	10,405	+ 16	+ 1,453	5.34	- 0.02	+ 0.04
Mechanics, Labourers	17,597	+ 4	+ 95	5.30	- 0.01	- 0.11
Total	72,523	+ 700	+ 7,092	5.58	- 0.03	+ 0.02
<b>Districts.</b>						
Northumberland & Durham	11,735	+ 72	+ 555	5.64	+ 0.01	+ 0.03
Cleveland	7,965	- 275	+ 113	5.07	+ 0.01	+ 0.05
Sheffield and Rotherham	10,474	+ 157	+ 1,721	5.09	+ 0.01	+ 0.12
Leeds, Bradford and other Yorkshire Towns	4,480	- 69	+ 508	5.61	- 0.08	+ 0.04
Cumberland, Lancs. & Ches.	13,826	+ 52	+ 439	5.37	- 0.15	- 0.10
Staffordshire	13,991	+ 165	+ 319	5.44	- 0.09	+ 0.05
Other Midland Counties	4,916	+ 34	+ 250	5.15	+ 0.09	+ 0.09
Wales and Monmouth	9,216	- 184	+ 1,190	5.66	- 0.07	- 0.21
England and Wales	74,795	+ 399	+ 5,710	5.59	- 0.02	+ 0.11
Scotland	17,628	+ 301	+ 1,390	5.37	- 0.06	+ 0.03
Total	92,423	+ 700	+ 7,092	5.58	- 0.03	+ 0.02

Compared with a month ago, the departments showed an increase in the number of workpeople employed, while four departments showed some decrease. The greatest increase was in rolling mills, 352; while the greatest decrease was in the Bessemer converting department (181), this being due to a decline in the Cleveland district. The districts in which the greatest increases in the number of workpeople took place, were Scotland, and Wales and Monmouth.

Compared with a year ago, every district, and every

department except the Bessemer converting department, showed an increase in the numbers employed.

The average number of shifts worked per man per week remained about the same as a month ago except at crucible furnaces, where an increase of 0.22 of a shift took place, and in Bessemer converting departments, where a decrease of 0.27 of a shift occurred. The Midland Counties, other than Staffordshire, showed the greatest increase, 0.09 of a shift; the greatest decrease, 0.15 of a shift, took place in the Cumberland, Lancashire, and Cheshire district.

Compared with a year ago, every district, and all departments, except Open Hearth melting furnaces and Bessemer converting departments, showed an increase, the greatest improvements being at crucible furnaces, 0.29 of a shift, and puddling forges, 0.24 of a shift.

### Pig Iron Industry.

Employment in this industry continued good, and was considerably better than a year ago.

Returns relating to 108 ironmasters show that during February four furnaces—one each in Cleveland, South Yorkshire, Staffordshire and Lanarkshire were re-lit; four were blown out, three of which were in Scotland, and one in Derbyshire was damped down. The number of furnaces in blast at the end of February was 337, as compared with 338 in January and 312 in February, 1905. The number of workpeople employed at the works included in the Returns which are summarised below is 439,120.

Districts	Number of Furnaces included in the returns in Great Britain and Ireland			Increase (+) or Decrease (-) in No. in 1906, as compared with	
	Feb. 1906.	Jan. 1906.	Feb. 1905.	A Month Ago.	A Year Ago.
England & Wales	36	37	70	-1	+34
Cleveland & Middlesbrough	35	36	69	-1	+33
Staffordshire & Lancashire	17	16	10	+1	+7
Derby & Nottingham	37	35	25	-1	+12
Yorkshire & Lincolnshire	25	25	24	...	+1
Stafford & Worcester	35	34	21	+1	+14
Shropshire & Montgomery	14	14	14	...	...
Other districts	7	...	7	-1	...
Returned from England & Wales	262	261	263	+1	+20
Returned from Scotland	75	77	70	-2	-5
Total furnaces included in returns	337	338	312	-1	+25

The imports of iron ore in February amounted to 582,315 tons, or 108,081 tons more than in February, 1905, and 208,821 tons more than in February, 1904.

The exports of pig iron from the United Kingdom during February, 1906, amounted to 81,083 tons, as compared with 56,508 tons in February, 1905, and 47,184 tons in February, 1904.

### Tinplate Works.

Employment during February showed a slight decline was better than a year ago.

compared with a year ago, there was an increase of 7 (1.7 per cent.) in the number of mills at work. The number of workpeople employed at the 412 mills was about 20,000.

The following table shows the number of mills at the works which were giving employment, full or partial,\*

	No. of Mills at Work	No. of Mills in such Works.	
		Working	Not Working
Works giving partial employment	...	...	...
Total at end of Feb. 1906	77	412	439
Working at end of Jan. 1906	...	...	...
Working at end of Feb. 1905	...	...	...

The exports of tinplates and tinned sheets, and black-plates for tinning, are given in the table below for the three periods stated. It will be seen that of the total exports of tinplates during February, 4,008 tons, or 12.5 per cent, went to the United States. The British East Indies took 4,251 tons, Germany 3,840 tons, the Netherlands 3,840 tons, and the other countries 1,107 tons.

	Increase (+) or Decrease (-) compared with		Increase (+) or Decrease (-) compared with	
	1904		1905	
	Tons.	Tons.	Tons.	Tons.
	1904	1905	1906	1907
To United States ...	...	...	...	...
... Other Countries	...	...	...	...
Total ...	32,481	32,481	32,481	32,481
To United States ...	6,027	6,027	6,027	6,027
... Other Countries	...	...	...	...
Total	...	...	...	...

### CHANGES IN RATES OF WAGES AND HOURS OF LABOUR.

Wages.



of £3,566 per week in January, 1906, and a decrease of £1,170 in February, 1906. The number of workpeople affected was 130,913, of whom 130,113 remained in the same position, and 800 sustained decreases amounting to £83 per week. The total number affected in January, 1906, was 117,702, and in February, 1905, 10,775.

Five changes, affecting 112,852 workpeople, were arranged by Conciliation Boards or mediation, two changes affecting 3,509 workpeople, took effect under sliding scales, and the remaining changes, affecting 14,552 workpeople, were arranged directly between employers and workpeople, or their representatives. In two cases, affecting 465 workpeople, the changes were proposed by representative committees of workpeople.

Summarised by trades, the number of workpeople affected by these reported changes and the net result of the changes in their working time were as follows:—

The number of workpeople (separate individuals) whose wages were reported to have been changed since January 1st was 258,701, as compared with 99,265, for the corresponding period of 1905. The changes arranged gave 255,852 workpeople a net increase of £6,537 per week, and 2,849 workpeople a net decrease of £2,100 per week. The net effect of all the changes reported was an increase of £4,437 per week, as compared with a net decrease of £2,808 per week in the corresponding period of 1905.

Groups of Trades.

	1905		1906	
	No.	£	No.	£
Building .....	190	2	810	81
Cable Making .....	37,600	—	135	145,650 + 1,371
Iron Mining .....	—	—	7,100	— + 181
Quarrying .....	232	—	2,550	— + 35
Railway Maintenance .....	2,160	—	11,560	— + 599
Iron and Steel Manufacture .....	27,512	537	44,850	— + 1,480
Engineering and Shipbuilding .....	27,060	215	44,284	— + 2,347
Power-Metal Trades .....	100	11	—	—
Textile Trades .....	308	2	140	— + 4
Other Trades .....	940	61	155	— + 17
Employment of Local Authorities .....	1,531	80	120	— + 11
Total .....	99,265	3,806	258,701	4,388

Hours.

The changes in hours of labour reported during February, 1906, affected 3,208 workpeople, whose aggregate working time was reduced by 10,508 hours per week. The total number of workpeople reported as affected by changes in hours of labour since January 1st last was 12,195, the net decrease in their working time being 40,585 hours per week.

Principal Changes in Wages and Hours in February.

Particulars of the principal changes in rates of wages and hours of labour reported in February are given below. The details of the other changes reported are not separately stated in this table, but they are included in the preceding statistics.

Trade	Locality.	Date in which change taken effect in 1905	Occupation	Approximate Number of Workpeople Affected by		Particulars of Change (Decreases in rates in italics).
				Increase	Decrease	
I.—RATES OF WAGES						
Coal Mining	Durham	5 & 12 Feb.	Underground Workers, Banksmen, Colliery Engine-drivers, and Mechanics	10,000	...	Advance of 1½ per cent., making wages 2½ per cent. above the standard of 1904.
			Other Surface Workers	...	...	Advance of 1½ per cent., making wages 2½ per cent. above the standard of 1904.
Fire Iron Mining	North Staffordshire	1 & 10 Feb.	Roastmen	1,000	...	Advance of 2½ per cent.
	Northumberland, Durham, Cleveland, Cumberland, and North Lancashire	4 Feb.	Steel Masters and Pitmen	1,456	...	Advance of 1½ per cent. under sliding scale.
	S. Yorks, Midlands, and Lancs.		Gas Production and Charge	621	...	Advance of ½ per cent.
			Wreckers	25	...	Advance of 1½ per cent. under sliding scale.
Iron and Steel	Lincolnshire	1 Feb.	Engineers, Mechanics, &c.	358	...	Advance of 1½ per cent.
	Midlands and Lincolnshire	4 Feb.	Steel Masters	460	...	Advance of 1½ per cent. under sliding scale.
	Scotland	4 Feb.	Roll Masters and Pitmen	972	...	Advance of 1½ per cent.
	S. & W. Wales and Monmouthshire	5 Feb.	Roll Masters, Iron and Steel Masters, Engineers, Crankmen, Labourers, &c.	1,577	...	Advance of 2½ per cent.
			Pattern-makers	1,290	...	Advance of 1s. per week.
			Foundrymen	2,530	...	Advance of 2½ per cent. on piece rates, and of 1s. per week on time rates.
			Smiths	71	...	Advance of 2½ per cent. on piece rates, and of 1s. per week on time rates.
			Brass Moulders	500	...	Advance of 1s. per week on rates of 1s. 6d. and over, and of 6d. on rates of 1s. 2d. and under.
			Rev. Engineers, Potter & Finishers	300	...	Advance of 1s. per week on rates of 1s. 6d. and over, and of 6d. on rates of 1s. 2d. and under.
			Engineers, Crankmen, &c.	220	...	Advance of 1s. per week.
			Joiners in non-Marine Engineering	240	...	Advance of 1s. per week.
			Iron Strikers and General Labourers	5,000	...	Advance of 2½ per cent. on piece rates, and of 1s. per week on time rates of 2½ per week and over, and of 6d. on rates of 2s. and under 2s.

# Our Weekly Biography.

R. Mullineux Walmsley, D.Sc. Lond., F.R.S.E., M.I.E.E.

**D**R. R. MULLINEUX WALMSLEY, Principal of the Northampton Institute, Clarendon, was born in Liverpool. Educated at Queen's College in that city, he was afterwards for a short time engaged in commercial pursuits.

In 1871, he matriculated at the London University; two years later he passed the examination in science, and in 1875, he graduated B.Sc.

Previous to taking up Mr. Walmsley was engaged at the Royal Naval School, New Cross. In 1881 he joined the staff of the Horological Institute, Clerkenwell, as assistant to Professor Perry. After twelve months' laboratory experience he undertook for Messrs. Ayrton and Perry the testing of the early forms of their well-known electrical measuring instruments. Later on, when the Finsbury Technical College was opened, he became senior demonstrator in the electrical engineering and applied physics department. In 1886 he obtained the degree of Doctor of Science at the University of London on the subject of electricity treated mathematically and experimentally. Shortly afterwards Dr. Walmsley went to India, and for twelve months acted as principal of the Sind Arts College of the Bombay University. While in this capacity the local government frequently consulted him on matters pertaining to the advancement of technical education in the colony.

Dr. Walmsley returned to England in 1888, and in May of the same year he was appointed senior mathematical lecturer and demonstrator at the Central Institution. Two years later he was chosen

to be the first occupant of the chair of engineering and applied physics in the Heriot-Watt College, Edinburgh, which post he filled until the end of 1895, when he was appointed principal of the Northampton Institute, London.

As an author, Dr. Mullineux Walmsley is best known in connection with that comprehensive work entitled "Electricity in the Science of Man."

The new edition of which, now being issued serially, appears to have been entirely rewritten by him. "The Electric Current" is another work which, also assisted in the translation and extension of "Guillemin's Electricity and Magnetism." He is a member of the Institution of Electrical Engineers, and by the desire of the Council he prepared a paper on the Electrical Exhibits at Edinburgh, which was read before that assembly on the occasion of its visit to the Scottish capital. More recently he read a paper before the Institution on "Transatlantic Engineering Schools and Engineering," in which he embodied the observation made during a three months' tour in the United States and Canada.

Dr. Walmsley is a Fellow of the Royal Society of Edinburgh, a Fellow of the Physical Society, a Fellow of the Chemical Society, and an ex-Vice-President of the Royal Scottish Society of Arts. In 1898 he was the recipient of the freedom of the Spectacle Makers' Company.

He is one of the founders and was the second President of the Optical Society of London and quite recently had the honour of being re-elected President of the Society of the South of the London University.



DR. R. MULLINEUX WALMSLEY, D.Sc. Lond., F.R.S.E., M.I.E.E.

## The Future of the Milling Machine.

Mr. Joseph Horner, A.M.I.Mech.E., has completed

machine practice, and he has incidentally earned the gratitude of engineering students by giving considerable space to the manufacture of cutters and the work of machines calling for the exercise of special skill. Many of the latest improved machines are illustrated with detailed drawings, and special attention has been paid to speeds and feeds. In short, the book is one which should prove an acquisition to any machine attendant. We quote Mr. Horner as follows as to the future of the milling machine:—

"Though it is true that milling lends itself more readily to special work than to that of a general character, the assumption has been too often hastily made that it has little chance in the general shop. It certainly would be most injudicious to make a radical change in the methods of a general shop already equipped with single-cutting tool machines. But it is wise to introduce milling gradually, beginning with those classes of work for which the long experience of other firms has proved them suitable. In a general shop there are a lot of articles which, without doubt, can be treated more economically by milling than by any single-tool machine. An enumeration of such articles is hardly worth attempting, but in the work of nearly any firm it would be easy to select scores of pieces to which milling would be eminently superior to any operation done on planer, shaper, or slotter. This remark is applicable not only to plane surfaces, but to those in which profile cutters can complete at one traverse many jobs which must otherwise be done by more than one cutter, and more than one series of traverses, and often by setting on more than once machine. There are also machines which are capable of dealing with heavy work—using long, fluted cutters, or gangs of cutters, or face cutters with inserted mills; and there are many bulky castings which can be tooled more rapidly thus than with the

class are not of recent origin, but they are being developed and brought more under the notice of engineers, their value becoming better recognised than they were a few years since. These facts afford an indication that the milling machine is destined yet to occupy as important a place in the general shop as the single-cutting tool machines have done.

Milling has not nearly reached its possible developments with us yet. The planer, shaper, and slotter still hold their own, with little rivalry in some shops, and surfaces are slowly tooled which could be done more expeditiously and often with equal accuracy under a good system of milling. Many machinists would be astonished at the large areas and the intricate sections which are milled in some shop practice, where milling is the rule, and planing and shaping are of secondary importance. The real era of the milling machine will not arrive with us perhaps until the pressure of closer competition develops its yet latent possibilities. It is from milling and grinding that the greatest developments of

## A New Calculator.

Messrs. J. Hadden and Co., 8, Albert-square, Manchester, have brought out a neat Rotary Calculator, which has some resemblance to a watch, and is carried in the vest pocket. It is intended to supersede the slide rule in all its operations. Briefly described, it consists of a disc within a ring, together forming a dial with logarithmic scales on both sides; it is surrounded by a metal ring, and protected on each side by a glass disc with a cursor line marked radially thereon, and is capable of being revolved by the two thumbs when it is required to set the cursor line. The disc is also turned in setting the scales to the required position by holding the nuts on either side, between the thumb and finger, the ring being fixed to the metal ring. The cursor lines are very fine and very close to the dial, and ensure great accuracy in reading. Most calculations are made with only one setting.

# Improved High-Speed Radial Drilling Machine.

By Messrs. James Archdale and Co., Ltd., Birmingham.

We illustrate on the opposite page an improved radial drilling machine which has been lately designed by Messrs. Jas. Archdale and Co., Ltd., of Birmingham, for use with high-speed steel. In addition to the strength demanded in machine tools dealing with the new steel, the designers have been careful to ensure for the machine rapidity and ease of movement, instant change of speeds and feeds, rigidity of arm and some other characteristics which should make it a valuable acquisition in the machine shop. The spindle can be raised or lowered, started, stopped, reversed, the feed altered, double gear engaged or disengaged, and the saddle moved along the arm by

machine is running at the highest speed.

It will be noted that the frame is of special design to ensure strength and rigidity, the column on which the radial arm and box table swing being connected to the upright bracket by a steel tension bolt which passes through to the base. The column is also supported and braced to the upright bracket just below the radial arm. The latter swings on special roller bearings, and is of deep box section, the spindle being arranged as close as possible to it to avoid spring or torsional effect.

The saddle is guided on square edges on the arm, and is provided with rollers on the top edge, making it easy of adjustment, and an improved locking arrangement is



length of saddle and readily operated by handle, pinion and rack.

The spindle is driven through a friction clutch of special design, which can be engaged by lever movement without shock. Double gearing is also carried on the saddle for the larger-sized holes.

The spindle can be instantly reversed, the reversing gear being operated by friction clutches. The spindle has

giving a noiseless positive drive. All the principal bearings are ring oiled from suitable oil reservoirs, enabling

minute drilled; 2 ft. 6 in. machine, 1 in. diameter of drill, 2,780 in. per minute drilled. The leading dimensions of the 3 ft. 6 in. machine are as follows: Max. radius of spindle, 3 ft. 6 in.; diameter of spindle, 2 in.; vertical traverse spindle, 12 in.; horizontal traverse spindle, 2 ft.

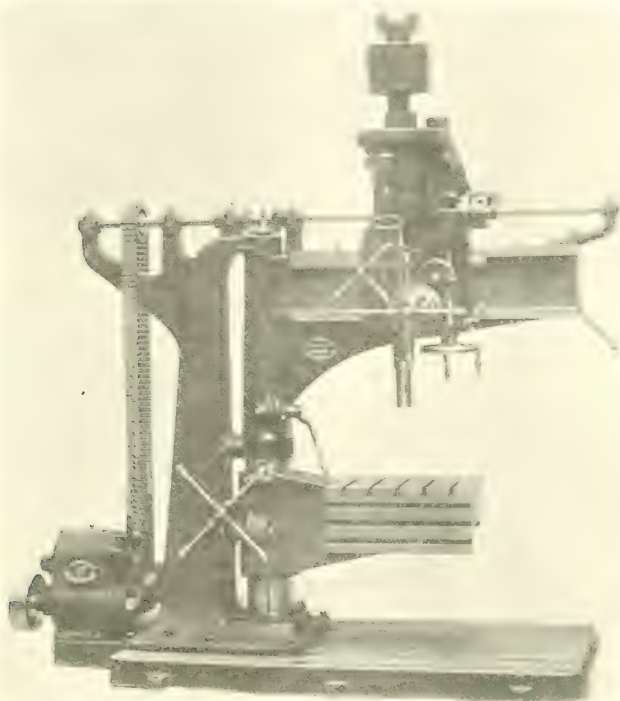


FIG. 1. PAULS' MACHINE.

quickly by hand, and extends in one length through upper and lower guides.

The box table has a vertical adjustment, and may be swung out of the way, leaving the base clear for large work. If necessary it can also be arranged to swivel round its horizontal axis.

The machine may be driven by a constant speed belt through a change speed box or by four speed cone pulley. The change speed box is of new design, giving nine changes of speed and with double gear a total of 18.

5 in.; spindle bored Morse taper, No. 3; admits spindle to base, 3 ft. 10 in.; admits spindle to table, 1 ft. 11 in.; size of table top, 24 ft. by 16 in.; vertical adjustment 1 ft. 8 in.; size of T-slotted base, 3 ft. by 3 ft. 6 in.; height of machine, 6 ft. 4 in.; driving pulley revs. with gear box, 500 per min.; diameter and width of same, 1 ft. by 3 1/2 in.; driving pulley revs. 16 in. cone pulley, 200 per min.; diameter and width of same, 14 in. by 3 in.; floor space occupied, 6 ft. 3 in. by 8 ft.; approximate 2 ft. 6 in., 5 ft., and 6 ft. radii.

# The British Engineering Output.

(As seen through American Spectacles.)

Being an Abstract from the Eleventh Special Report of the U.S. Commissioner of Labour on the Regulation and Restriction of Output.

## II.—Shipbuilding.

AN AMERICAN noted shipbuilder says that in the great majority of cases the men in the engineering and boiler-making departments have worked much better than before, and, on the whole, quite steadily. However, owing to the good wages prevailing, they have taken an occasional holiday more than usual, but on the whole their conduct compares favourably with that of other men in busy times. He says that his firm works largely on piecework, and is increasing the amount so worked. They have introduced many innovations, which have been welcomed by the men. In his opinion the old hostility against piecework was that it was coupled with a limitation of earnings to one and one-half times the time wages, but since abolishing this limit this firm has had no trouble. He had to dismiss one clerk for holding back part of the pay if the men earned more on piecework than he thought they should do.

He adds that one of the most liberal-minded employers—does not hesitate to assert that where trouble comes from the piece price and the bonus systems (which he does not work, but approves) it comes, in fact, because the employers wish to fix the prices too low. In his opinion it was a very fortunate thing that the workmen lost the eight-hour strike, because they got the joint standing committee, through which they are able to make their genuine grievances known and to air the meanness of their employers. They thus create a public opinion, which, after all, is the most effective remedy for genuine evils. In the marine work this establishment has but little piecework. Since its contracts very largely for the Admiralty and builds large merchant vessels, it has but little repetition work; because, especially in the Admiralty work, quantity is a secondary consideration, excellency always being regarded first. The firm doubtless has some idle men and some unnecessary loss of time, but this he does not regard as serious. A large part of the friction could be avoided if the men were taken into confidence a little more, and the workmen, if consulted beforehand, could be induced to consent to many things against which they naturally would countenance the

entering the trade is a genuine barrier to the elasticity which is needed. He says that formerly a squad contained one riveter and one strong labourer, who also riveted; but now the unions forbid the labourer to rivet and require two skilled riveters. The whole piecework system is in a very unsatisfactory condition, the trade is stagnant and the labour is inefficient because of a failure to use modern organisation and machinery. He confirms the statement that there is no inducement for employers to improve in these particulars, as they are unable to get a reduction or at least a significant one, on the piece prices. Therefore they must either remain stagnant or the men must put up the labour saving devices themselves in order to save effort. The employees think that people must have ships and that they will come to their yards for them.

The cost of labour, however, is becoming so high as to force the shipbuilders to demand prices for ships which they cannot get in the face of international competition. He quotes Mr. Wilkie, secretary of the shipwrights' society, as saying that if a man wants a ship he must have it. In his opinion this omits the question of international competition as well as domestic competition in forms of investment. If labour, through restriction of output, becomes less efficient, and therefore more expensive, in shipbuilding than in other forms of industry, people will cease to want ships as they did before and will prefer to put their money in other forms of investment when they can do so to better advantage.

## The Question of Reasonable Wage Limit.

An official report of the boiler makers' society to the Tyne district says: "Work is being sectionalised to such an extent that men, through long custom and their own inventive powers, are able to increase their earnings by the production of a greater volume of work. Some employers are seeking to take advantage of this to reduce prices. This ought not to be, as the inevitable result of such a policy will cause the men to restrict their powers and so to hamper the quick despatch that employers are always striving after, and will prevent the necessary clearance for fresh orders." So far as could be ascertained, the feeling seemed to be universal among the employees that the employers had in mind a lump sum of wages which they considered a sufficient amount of earnings and would attempt to so readjust piece prices as to reduce the workmen to that basis. Furthermore, contact with the employers produced the impression that the workmen were right in this contention. Several instances were found of progressive employers who had much more liberal views than these, who usually stated that they were bound

## Growing Cost of Labour.

It is to be deplored, however, that the employer-protection does not believe there is a formal agreement to restrict the output, but wages are good and employment cannot be increased so long as they can take it easy, and the best union is to keep the number of men

were entirely right in their fear that an increased output at piece prices would result in an effort on the part of the employers to reduce the wages.

In explaining the power of the boiler makers' society, one of the members said: "We have a complete monopoly of labour of this sort. The employers cannot do business save by mutual agreement with us. By means of limitation of apprenticeship, especially in a growing community, we can continue to hold the monopoly. We have much higher wages than the average skilled artisan of the kingdom, which enables us to occupy a first place in the labour world. Our wages are so much higher than those prevailing in other important skilled trades that in the eyes of the employers we have reached all reasonable limits. Should we work as hard as we do now, and work six days in the week, instead of four or five, according to all prevailing sentiments and traditions the total amount of our wages would be so large as to lead employers inevitably to attempt to reduce the piece prices.

Said a most intelligent workman: "If we should work six days in the week at the present rate one of two things would happen within six weeks. Our piece prices would either be reduced or we should be locked out because we refused to accept a reduction. In other words, we should find ourselves either in the position of working six days for the same lump sum of wages that we get now in four or five, or we should have a great fight on our hands because we refused to do so. Considering our superior position in the labour world, we are inclined to let well enough alone and to enjoy the dignity and leisure of our position."

Different workmen in different centres, when confronted with this statement, granted its substantial accuracy, and ceased to try to impress the truth of the allegation that the lost time was due wholly to bad weather, bad management on the part of the firm in furnishing material, sickness, accident, and other causes tending to break the squads from time to time. The truth of this explanation was confirmed openly by employer after employer. It was confirmed more frequently, however, by remarks made by employers who seemed to be entirely unconscious of the fact that they were bearing out the truth of this position, for whenever the view was expressed to the employer that the industry seemed to be in a deadlock, resting on mutual distrust, and that under present conditions the deadlock could be broken only by the employer guaranteeing as much wages per unit of product as the men now receive, and trusting to the spreading of fixed expenses over the larger product for his gains, it was nearly always met by the statement that under such conditions the employees would earn an unreasonable amount of wages.

Working men, it was alleged, would cease to be working men and would want to become managers. Nothing seems to be more deep-seated in the mind of the English employer than this feeling that the danger involved in permitting any working man to earn very much more than the traditional wages of men in his class will destroy the foundations not only of all industry, but of all social life as well. The result is in this industry, as in so many others, that the two parties, each being too strong

to be conquered by the other in open fight, are willing to proceed on traditional and ineffective lines rather than to make any change the result of which might give the other party greater advantage than is held at present. The workmen are perfectly willing to do more work if they are paid for it at the rate per unit that they receive to-day. They are not willing to do a greatly increased amount of work for a very slight increase in the sum total of pay, thus giving to the employer very much the larger portion of the gain from their increased effort. It is distinctly a fight over the question of what is a fair day's labour for a given day's pay.

### The Employers' View.

employees are not giving enough labour for the pay that they get to-day, and virtually assume that the latter ought to give all they are physically capable of for the present pay. On the other hand, the workman believes that he is giving a full equivalent for the pay he is getting and stands out firmly for what he calls full pay for every additional unit of product turned out. While there may be various sporadic attempts of the employers to force a different system, and while if it were simply a question of either party coming to actual starvation, there is no question that the employers could hold out the longer, it looks as though the boiler makers, in view of all the circumstances, would be able to maintain their position on this point for a long time. Both sides have learned that open fighting does not pay and are, as it were, sleeping on their arms. The two parties are inextricably tied up by working agreements. These agreements are of various kinds, some with individual yards, some with district associations, some for the whole country, all of them virtually providing for the settlement of differences between the two parties by conciliation or arbitration without stoppage of the work over which the dispute arises.

The society has reached that degree of strength which makes it impossible for the employer to make any change whatever without previous conference and agreement with his workmen. It is not a question any more of what the employer thinks would be advantageous, or of what the foremen think would be helpful, or what the labour leaders think would be beneficial; it is a question of what the two bodies as a whole can be brought to see is a good thing to do. With the great jealousies among the employers, and with the high degree of secrecy in their affairs, and with a full knowledge on their part that experiments cannot be made by them without running the risk of giving the boiler makers a greater advantage than they now have, and greater than the experiment would justify, it can easily be seen how all the circumstances tend toward crystallisation in the industry and make any improvement in organisation, machinery, or method, if not impossible, at least difficult and slow of operation.

### The Foreman and the Union.

One great point of controversy, and a point which causes so much friction as to be regarded by employers as a serious restriction of the amount of work done, is that of the relation of the foreman to the union. It is almost universal that the foremen of every grade are



It is not the nature of the ordinary workmen who are in the shop. In the engineering trade, in which it may be truly said that the general average of the union men is higher than that of the non-union men, for the trade is well organised, the question almost daily arises, "What is to be the fate of a union man who is made foreman?" Few things are more warmly and more frequently discussed than the question whether the foreman is the employer's man or the employees' man. It has been customary in many trades for a member of the union, when made foreman, to remain a member of the union and take no active part in it. It goes without saying that, with the present strength of the union, it would be extremely difficult in a shop where most of the workmen are union men, to have as foreman a man who never has been affiliated with the union. On the other hand it would create a great deal of jealousy and increase the probability of conflict if a man, on being promoted to a foremanship, should resign from and forever renounce the union. With the degree of contention that has existed for a decade or two in England it is inevitable that working men should believe that they are entitled to a foreman in sympathy with themselves. On the other hand, the very fact that the employees want the foreman so much makes the employers suspect that the foreman whom they are paying extra wages to protect their interests is, in the case of a controversy, the actual representative of the opposing interest. One frequently hears remarks from the employers as to the untenable position of having a foreman who is subject to discipline and fine by the workers.

### Efforts to Wean Foremen from the Union.

As a result of the struggle of the employers, notably some of the larger ones, have been making a protracted and a serious effort to wean their foremen, whom they must take from the union men, from the union. These employers, who say that they are not opposed to unions are very keenly alive to the fact that one great element of the strength of the union is the fact that the money benefits of one kind or another, such as funeral pay, sick pay and death pay, are not separated from the trade benefits or fighting funds. These firms therefore have attempted, with a moderate degree of success, to organise a foremen's union as a separate organisation. The foremen are asked to contribute a small sum to the contributions to the benefit funds of these foremen's unions. So long, however, as the foremen continue to be taken chiefly from union men, and the labour union benefit funds are not separated from the other funds of the society, it is extremely difficult to wean the foremen from their unions. For the foremen are largely working foremen, still continuing to work with their own hands, and their pay is but slightly larger than that of the workmen. Furthermore, notwithstanding the fact that they are supposed to have a more responsible position, and to represent in a peculiar sense the interests of the employer, all of their instincts, training, and social life were, before their promotion, with the union men, and must, in a society organised on a class basis, continue to be entirely with that class. The consequence is that any attempt to break all these ties and separate a man who becomes a

foreman from the mass of the union men is, under present conditions, a comparatively hopeless one.

### Stringent Rules Regarding Foremanships.

The unions in this trade have very stringent rules in regard to their members accepting foremanships; for instance, in the Tyne district the rules of the union in the engineering trade forbid a member to accept a foremanship at less pay than the former foreman had. In the shipbuilding department of one of the largest firms on the Tyne there was a controversy on this point. On the death of a foreman who had been with the firm for many years the manager offered the position to one of the young workmen at 5s. a week less than the previous man had received. The man declined the foremanship without giving any reason, and was dismissed. The manager stated that at the time he was not aware of the fact that under the rule of the union the man would have been fined 4s. for accepting the position. The secretary of the union demanded that the man be reinstated on the ground that he had been dismissed, not for refusing to do his work well, but because he would not do work which he never had agreed to do and for which he was not hired. The manager insisted that he did not dismiss the man simply because he would not accept the foremanship, but because he was not ready to accommodate the firm in an emergency. The union representatives demanded his reinstatement. The final result of the case is not known, but it led to a long correspondence and numerous conferences and to a general slackness and sullenness on the part of all the employees in the department, which must, in the present state of mind of the English union working men, have caused a serious check on the amount of product turned out, and, perhaps, on its quality also.

The manager at one of the largest shipping and engineering firms said that theirs is about the only firm that succeeds in forcing the foreman out of the union. It was this firm that organised the foremen's union to wean the foremen from the working men's union by establishing large benefit funds, subsidised by the employers, in the foremen's union. In this connection it seems interesting to note that the more wide-awake employers in the various branches of the trade are coming to realise more and more that the real trouble with the foreman question is with the employers. As Mr. Charles Heathcote, of Manchester, said: "The trouble with English employers is that the employers are not willing to pay a sufficient amount for superintendence. If the foremen are to be raised in intelligence and efficiency to a rank above that of working men they must have very much larger pay and larger responsibility than the average English employer is willing to give them to-day. Extra pay on a scale that will take him out of association with the members of the union to which he has always belonged; neither will it give him that prestige that will enable him to exercise that authority over the workmen that a foreman ought to have. If the foremen are not to be the workmen's foremen rather than the employers' they must be raised in pay, dignity, and importance much beyond anything that has yet been done."



LAUNCH OF THE "DOLLY" BOAT.

## The Development of Under-Water Craft.

By Robert G. Skerrett.—(Continued from page 572.)

It is not possible in so brief an article to describe in detail all of the particulars of the Lake boats, but it may be instructive to know that all of them have ample and comfortable sleeping accommodation for their crews, that electrical cooking facilities permit a crew subsisting aboard for days at a time, that they are twin-screw vessels, and that they carry from three to four torpedo tubes for the loading and discharge of which no complicated water ballast system is required. The boats of this type all submerge on an even-keel, and are designed to work with a large reserve of buoyancy.

Their large conning-tower and the character of their superstructure are such as to make the vessels very weathery when running light, and also produce a very considerable buoyant moment when the vessels are running submerged. This buoyant moment of the superstructure and the conning-tower, combined with the low position of the mass of the weights in the main hull, holds the boat, so to speak, between two opposing forces, and gives her a longitudinal stiffness impossible of attainment in boats of the diving type.

### The Question of Safety.

When the *A 4* sank, she was at a depth of some 60 ft. and attained, so Sub-Lieutenant Godfrey Herbert testified at the court-martial, a trim by the head of 40 deg. Fortunately for the *A 4*, the character of the bottom and the fact that the boat was not underway when she sank, saved her from a probably fatal plunge and the possibility of some time in the sand. Had this

and atmospheric pressures would have meant a downward force of many hundreds of tons, and the release of the vessel from that predicament by any means at her disposal would have been out of the question, and the chance of her salvage would have been very debatable. In much shallower water the ill-fated *Farfadet* buried her nose, and it was due to the great stress thereby placed upon the salvage tackle that it parted at the critical moment and sent the crew to their death after their heroic struggle for life through the frightful hours of their imprisonment.

It is impossible for the Lake boats to attain any such dangerous angle in running submerged, and the character of their bows and the presence of the rolling wheels under their keels would effectually prevent such a mishap, and at the worst the vessel could strike only at a very obtuse angle and would glide on safely. This even-keel order of submergence and under-water progress combined, of course, with longitudinal stiffness permits of the freest movement of the crew at all times in the fullest discharge of their duties.

A further aspect of this longitudinal stiffness, so far as it relates to the question of safety, is the fact that the control of the boat in the vertical plane calls for no special training, peculiar adaptability, or an exacting and fatiguing measure of vigilance. The speed of the boat being constant, the angle of the hydroplane or submerging rudders remaining fixed, the only thing that would effect the degree of submergence would be a

amidships, any change in the force of the passing currents would only bring the boat up or send her down a little deeper without affecting her longitudinal trim.

Considered from the point of view of a military instrument that may be put at short notice in the hands of men of an ordinary measure of seafaring and mechanical understanding, the even keel boat is unquestionably superior, but little practice being necessary to make any man familiar with the means of perfectly controlling the boat vertically when once trimmed for submergence.

The superstructure of the Lake boats solves all of the difficulties peculiar to the diving type as determined by Naval Constructor Taylor in his model experiments, and the vessels are able to run at any stage, either of part or total submergence, without involving the risks common to the diving boats he described. As is well-known, the space in the superstructure is devoted to fuel tanks, lubricating oil tanks, the compressed air reservoirs, and the stowage of deck hamper, thus leaving to the free space in the inner hull-room for other important purposes—one of them being the very comfortable

#### Running in the Awash Condition.

The boats of the Lake type are designed to operate under engines in the light condition, in the deck awash

condition, and in the conning-tower awash condition. In the latter condition, only the sighting-hood and the observing instrument are above water, and with only this extremely modest target exposed, no difficulty whatever is experienced in running the boats under their engines. An especially constructed induction valve insures an ample supply of air, and yet is so designed as to close instantly in advance of the surge of a passing wave. Because of the buoyant superstructure, the boat rises and falls readily in response to the mass of the surface contours, and there is none of the sluggishness and tendency to bury common to the boats with spindle-shaped hulls.

With boats of the diving type, it is absolutely necessary that the vessels should be sealed and made watertight under similar conditions of trim and surface disturbance. The diving boat then, instead of being able to measure her radius of action by her fuel supply, is narrowed down to a performance limited to her battery capacity. In round terms, the difference is so great that for boats of corresponding dimensions, the Lake submersibles would have an endurance of days against the diving submarine's endurance of hours only. In addition to this, the Lake boats would have the greater speed guaranteed by their engines as against the more limited speed and narrowed radius of action common to the electrically-propelled craft. Of course, the Lake boats suffer the same relative restriction of endurance common to all under-water craft when running totally submerged under electrical impulse; but in the power to run under engines, and be instantly ready to submerge entirely with immediate recourse to electrical propulsion, the Lake boats are able to take the sea, and to hold the sea in the face of the alert scouting craft of a possible foe, and with a minimum risk of detection. In this particular the Lake boats are to all other under-water craft what the "destroyer" of to-day is to the surface torpedo boat of only a few years ago.

#### United States Submarines.

Applying to large boats the principle of refined water-ballast control, somewhat similar to that practiced by Goubet in his small craft for the nice adjustment of reserve buoyancy, some of the submarines now in the United States Navy, and those now building for that service, have a series of small tanks so arranged that the final reserve buoyancy of the boats can be reduced progressively to a condition of zero or balance with the surrounding water when submerged. The idea of this delicate manipulation of buoyancy is to enable the boats by this reduction of their margin of safety—always seriously limited—to lie inert with only a very limited portion of the sighting instrument out of water or to hold the boat in a state of absolute balance at any desired depth of total submergence. This arrangement has been tested, in smooth water, for periods of two or three minutes, and upon this record has been based a claim for practical utility in time of war. It is said that the boats when so manipulated can lie stationary and observe the approach of an enemy without fear of detection on their own part. It is also claimed that power may thus be conserved and stress upon the crew reduced to a minimum—only one man being required for watch service and for the control of this system. It must be remembered, however, that the vessel is subject



FIGURE 106. AFTER BUT WILL OF THE BOAT  
FROM THE DECK OF THE LAKESIDE  
THE CONNING TOWER.



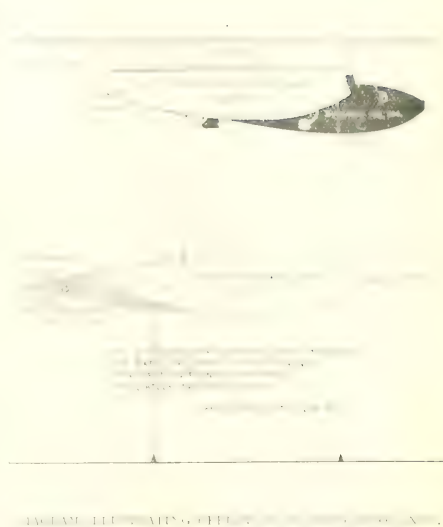
by motive power. This means that there must constantly be a man stationed at the navigational wheel, another man constantly at his post in charge of the diving rudder, that another man shall be ever ready at the motors, and that the entire crew shall be held absolutely immobile and ready for the restrictions or the conditions imposed in running submerged. These boats cannot anchor in this condition: and in the presence of waters of changing salinity, such as would be found at the mouths of swift-running rivers on the cbb, the practicability of maintaining such a balance would be problematical to say the least, and the continual changes of specific gravity of the surrounding water would call for such a measure of vigilance on the part of the operator as to make the work dangerously exhausting, and would entail risks that could bring with them no balance of compensating efficiency.

### Reserve Buoyancy.

The Lake boats, can submerge and maintain a position at any desired stage of either part or total submergence, and in this condition retain always a reserve of buoyancy much in excess of that called for when running submerged. The boats are anchored fore and aft, are unaffected by either currents or the changing specific gravity of passing waters: and the degree of submergence is absolutely under the control of one man, who operates the electrically-driven drums of the anchor hoists from his station in the large conning-tower. Each of the anchors weigh enough so that with a reserve buoyancy equal to half of their combined weights, the boats can be drawn bodily to the bottom or held immobile in suspension at any desired depth, while their geographical positions remain fixed. One of these weights is sufficient to anchor the boat when upon the surface, and the boat can be anchored in a seaway from the controlling station in the conning-tower without exposing in any manner persons upon the deck for that purpose. This cannot be done with boats of the diving type: and it is necessary for members of the crew to go out upon the deck to break out the anchor and clear the gear for this purpose, and it requires no particular range of imagination to appreciate the risks involved and under some circumstances, weather conditions prohibiting even this. The accompanying diagram illustrates graphically the distinctions between the two types in these particulars.

### Precautions.

The anchoring weights also are safety features, and in case of any mishap admitting water to the boat, or any loss of positive buoyancy that may threaten the vessel, it is only necessary to cast free the winding reels and to let these anchors go to the bottom on a run, giving the vessel a positive buoyancy equivalent to the weight of their mass. In addition to this, the vessels carry emergency drop-keels, varying in weight with the displacement of the vessels. In boats of the *Protector* type and size, this drop keel weighs five tons. Assuming that a leak has produced a negative buoyancy of a ton, and that the vessel has settled to the bottom, or is sinking, the release of the anchoring weights and the detaching of the drop-keel at once gives the boat a positive buoyancy of five tons, which



would be enough to bring the vessel to the surface, tower out of water and admit of the ready escape of her crew or recourse to the engine-driven pumps, which would probably be amply capable of controlling all probable leaks. On the other hand, assuming that a diving boat under similar circumstances goes to the bottom and has no keel to drop, and, assuming as in the case of the Lake boat just mentioned, she is unable to use her electrically-driven pumps, a ton of negative buoyancy in the presence of increasing leaks would probably be far too much for the control of hand-worked pumps driving against a head of water due to any considerable depth: and the chances of escape from such a vessel would be practically *nil*.

In the case of the Lake boats, the large conning tower which has been a distinctive feature of the type since their inception, besides constituting a central control station, is big enough to hold the entire crew, and is separated from the spindle hull by an air or watertight hatch. This conning-tower then becomes a safety compartment under some circumstances, facilitating either the escape of the crew or the salvage of the vessel. The control of air within this tower when separated from the rest of the hull is, of course, independent; and while, for salvage purposes, it might be necessary to use heavy air pressures in the main hull, the atmosphere in the conning-tower can be maintained at normal and refreshed *ad libitum*. In this way the boats could be brought to the surface and the upper hatch of the conning-tower opened without risking the sudden release of the compressed air in the main hull and incurring the danger of the craft refilling immediately, and either sinking or bringing a dangerous load upon the salvage tackle. Captain Bacon has pointed to the



THE LAKESIDE DIVING COMPARTMENT.

the diving compartment, and the Holland 63, the largest of the submarines built in this country, is now being built for the United States Navy.

### The Lake Boat Diving Compartment.

At the forward end of the Lake boats there is a diving compartment. This compartment is practically a mobile diving bell, and its working principle needs no elaboration here. In these boats, however, this chamber is primarily for military purposes and is designed to permit a diver to leave the vessel and to examine deliberately the water-bed in search of cable; or the connections of submarine mines, or to permit grappling operations for either of these to be conducted without leaving the diving compartment. The entire practicability of this feature, from a military point of view, was reported upon by the Board of Army Officers which examined the *Protector* in January, 1904, at Newport, R.I., U.S.A. When operating in this manner, the boats rest upon the bottom with a negative buoyancy regulated entirely to suit the character of the water-bed and the presence or absence of currents. The travelling wheels are held at the end of arms so operated that they serve as elastic buffers against shock, either of a direct blow or that due to the vertical movement of considerable moment found on some coasts in the shape of ground swells, even at depths of 30 ft. or 40 ft.; and in the absence of such a check the boats might be either seriously jarred or wrecked if not dangerously damaged. This feature of the Lake boats enables them to operate safely in waters of from 25 ft. to 30 ft., and to follow navigable channels in a manner absolutely prohibitive to boats of the diving type.

### Submarine Defence.

Continuation of the value of this feature of the Lake boats is found in the latest report of the Commandant of the School of Submarine Defence in the United

States Navy. As the report is available for the first time, it is of interest to the country as adjuncts to the fixed mine defence of the country has been under consideration by the Board for the Revision of the Report of the Endicott Board during the past year, and the Torpedo Board has been called on for remarks on this subject. In this connection attention is invited to the following extract from my report of last year, to which experiment and practice with the submarine boat in this country and abroad has but added force:—

"It is now again desired to invite special attention to the unquestionable value of submarine boats as an adjunct to fixed mine and movable torpedoes for the defence of the particular places named in the report of the second committee; and also to the need of a boat of the Lake type or similar type at the School of Submarine Defence for experimental work, as this is the only submarine boat, so far known, that can be efficiently used in countermine electrically-controlled mines."

The diving compartment is flanked fore and aft by two complete air and water-tight bulkheads; and these are further reinforced by the partial bulkhead at the rear of the air-lock. As a result, these bulkheads serve the purpose of doubly safeguarding the craft in case of a head-on collision. This diving chamber is also of such magnitude that the whole crew may be mustered therein without difficulty, and, under some circumstances, might become a place of escape and a way to reach the surface, provided the depth were not too great. It must not be forgotten, however, that this compartment is primarily a military feature, and while it is incidentally a very considerable promise of safety under certain conditions, still its reason for being is as first described. The safety elements of the Lake type have a prime bearing upon maintaining the morale of the crew in the face of the enemy and the hazards of service in time of war.

Lieutenant J. H. Tomb, of the United States Navy, an officer who has had personal association with both the Holland boats in the American Navy and the Lake boats that have manoeuvred in that country, has recently contributed an article upon submarines to the United States Naval Institute. In conclusion, Lieutenant Tomb says: "It is by competition that the greatest progress is made. If we had one of the Lake boats on this coast, and one on the west coast to compete against the Holland boats, I am confident that our submarine navy would soon rank among the first in the world instead of holding the fifth or sixth place as it bids fair to do. For harbour defence nothing is superior to the defensive submarine, and the offensive submarine will soon rise to an important factor in battle tactics at sea. The main features of the even-keel type are superior to those of the diving type; and, seeing this, it is necessary for our navy to develop that type if it wishes to have an efficient and capable submarine navy in the future."

All of the Lake boats are submersibles and not submarines, as that term is commonly understood. All operate upon an even keel; and all by reason, of their methods of operation, sea-going capacity, and habitability belong to the order of offensive under-water craft.



[illegible]

### A New Tube Cleaner.

The 1987 tests were given on Monday in Pompeii, near the Club de la Méditerranée, by Mr. Marcello, of the Club house, and his crew, by which the tubes of marine and locomotive boilers were subjected to pressures that, opening the valves, I could see the apparatus to be like the smokebox of a steam locomotive, and promotes complete combustion of the

### The "Virginian" Trials.

Mr. Arthur Peter Ferguson, the undersigned, is in command of the land at her behests. Mr. Frederick Clark and, C. Belfast, is this day, and to the world's speed trial.

### Improved System of Coal Combustion.

A large number of boilers have been so fitted, and the best results have been in the form of less smoke. The invention has resulted in saving in fuel, and consequent saving in cost.

### New Straightback Steamers.

Mr. Henry Bate, designer, who has taken out patents in connection with steamers of this type, claims that his design gives the following advantages over ordinary steamers: Complete self-trimming, increase of 60 per cent, water ballast, increase of cargo capacity, superiority in heavy weather in ballast trim, superior form of construction, clear holds, and high freeboard with greater reserve of buoyancy.

### Early Use of Iron.

A lecture on this subject was delivered before a meeting of the West of Scotland Iron and Steel Institute on Friday last by Mr. Bennett H. Brough, secretary of the Iron and Steel Institute. Mr. Brough pointed out that the discovery of an iron sickle under the feet of one of the sphinxes in Egypt proved that the smithy of that country was older than 6000 B.C. but in Chinese history there were references to iron dating back to 2357 B.C. The lecturer also gave details as to the use of iron in different countries in Europe. With the discovery of cast-iron and the introduction of the blast furnace, the first stage in the history of iron closed about the end of the fifteenth century.

## North-East Coast.

## NEWCASTLE-ON-TYNE.

### Trade Outlook.

the market is directed more and more to the probability of a considerable decrease in the stocks of iron in the warrant stores at an early date, and the shipments of pig iron remain on a scale which proves the correctness of this forecast. The demand for iron remains steady, but it is to be noted that the imported one has gone up in price, and, of course, coke is higher. New orders are in the market for new steamers, but the high prices of raw materials, as the result of the war, is having the effect of keeping new orders back, and although some builders have been able to obtain iron in hand, others are less happily situated. The Board of Trade returns, ending with the 15th of February, show a decrease in the total tonnage of 188,000 tons, or 1.5 per cent, as compared with the 12,500,000 tons of the corresponding month of 1914. The tonnage of iron ore has increased 100,000 tons, or 1.5 per cent, and the coal trade has increased 1,000,000 tons, or 1.5 per cent. The important increase in the demand for pig coals has just been concluded. Since the outbreak of the war, the demand for pig coals in America is about 1,000,000 tons a month, but the supply is

reloaded with 1000 rounds and re-ranged, though in only half the time.

## Engineering News.

The leading firms engaged in the engineering trade in the district are fairly busy on running contracts. Messrs. Richardson, Westgarth and Co. report orders for several large steam-driven blowing engines, two of which are for Bell Bros., and the remainder for South Wales firms. The firm is also engaged on four 200-ton Talbot furnaces for the South Durham Iron and Steel Co., and two 175-ton furnaces of the same type for the Palmer Shipbuilding Co. The Hartlepool establishment of the same firm is also actively employed, the new shops for the manufacture of steam turbines being now in operation and full of orders. The Government work includes the re-sitting of H.M. Cyclops and building a submarine. A reference has been made in a previous issue to the North-Eastern Railway extensions at Stollagill sidings, and this



The business of the company has been very successful, and the shipments have been very large.

### North-Eastern Steel Company.

The business of the company has been very successful, and the shipments have been very large. The company has been a decided expansion during the period covered by the report, and the business has been gradually advancing prices. The works were not only fully employed during 1905, but the year's make of coke, iron, and finished steel has been the largest in the history of the company. The opinion is expressed that prospects of business for the future are brighter than they have been for some years, and that the company commenced the new year with a good order book at remunerative prices.

### The New Cunarders.

It is stated that the electrical installation to be fitted on board the Cunarder, which is being built by Messrs. Swan, Hunter and Wigham Richardson, of Wallsend, will be the most complete of its kind. The generating plant will consist of four sets of Parson's turbo-generators. The lighting alone will require 5,000 lamps of 16 candle power, while on the bridge deck the four powerful searchlights and two masthead and two side lights are fitted with Martie's electric duplicate apparatus, which automatically replaces a broken lamp filament. The major portion of auxiliary machinery will be driven by electric motors, and in connection with the ventilation there will be about 60 large electrically-driven fans. The water-tight doors throughout the ship will be closed automatically from the bridge.

### Tees Pig Iron Shipments.

A study of the shipments of pig iron from the Tees during the present month induces the belief that the figures will set up a new record. Including the Skinninggrove figures, the shipments per working day have averaged 4,600 tons, which it is unnecessary to say is much above the average for the present period of the year. Concurrently with these increased shipments less Cleveland iron will be produced, owing to the turning of some blast furnaces from the production of Cleveland to that of other kinds of iron. A continuance of this process would have a marked effect upon the statistical position, and would influence the quotations for manufactured iron.

### New Chair of Naval Architecture.

Naval Architecture, which hitherto has not received adequate attention on the part of educational authorities. The Armstrong College at Newcastle has now fallen into line. A committee meeting was held to discuss the matter on Monday last, under the presidency of Lord Armstrong, and all the leading firms of ship-building were represented.

Naval Architecture with a salary of £800 a year, guaranteed for five years. The holder of the professorship will be at liberty to engage in consulting practice in addition to fulfilling the duties of the professor. The appointment is to be made at an early date, and it is expected that the work of the department will commence from the beginning of the next year.

### New Works for the Tyne.

At the annual meeting of the Newcastle Electric Supply Company in Newcastle, Mr. J. T. Merz announced that a chemical company, whose name he did not mention, would shortly commence to lay down electrical chemical works at Carville, Wallsend, and would, together with another firm, take from the Newcastle Electric Supply Company the supply of electricity night and day, Sundays and week days. It is stated that the works will be completed by the end of the year.

### Gift to Armstrong College.

Messrs. Richardson, Westgarth and Co., Hartlepool, have presented to the engineering department of the College one surface condenser, specially made for experimental use in connection with the steam plant in the College, and one casting for a smaller condenser of unusual proportions. The thanks of the Council were awarded the donors.

### Improvements at Warkworth Harbour.

The Harbour Commissioners have under consideration a scheme of improvements. It is intended to extend the south jetty to the south pier head, and to extend the south pier out a distance of 240 feet seaward, parallel to the north pier, by which means it will be possible to obtain two extra feet of water on the bar. In addition to this a system of groynes is to be established at the north sands in order to combat the serious inroad the sea has been making during

## Yorkshire District.

SHEFFIELD.

### Sheffield Trades.

The outlook in this branch is not regarded with quite the same feeling of hopefulness as it was a week ago. One factor which makes for weakness is the position of pig iron, and it is to be noted that the Lancashire ironmasters have now decided upon an all-round reduction of 1s. per ton in price on all quantities of their iron. There is one aspect of this reduction to which attention may be directed. It is

less, for the reason that, having obtained this small concession, consumers may be inclined to wait, in the expectation that still cheaper quotations will be seen in the near future. The steel trade remains fairly brisk, and indeed the official records of employment show that it is in a very satisfactory condition. As pointed out in previous issues, however, the present activity is mainly due to old orders, and it is quite certain that the volume of new business which

is being placed so as to meet a maintain the present rate of output. It is hoped that this disposition will place tool-makers and tool continue. In one stretch of the steel trade a good demand is abroad, and, too, we refer to the best class of tool steel. Local manufacturers who go in largely for the production of rolling stock materials are also actively engaged as, if orders from home railways are not very plentiful, they are encouraging inquiries from abroad, notably from the Indian railways.

The placing of contracts for steel, stamping, and crushing machinery and other requirements for the mining districts of South Africa has been checked, but the fall is expected to be of only a temporary character. Manufacturers of tool and garden tools have their books filled with orders, and competent workmen are being sought. For many classes of goods there is a heavy demand for the Australian market. At the present time the call for steam coal is large, both for manufacturing purposes and for export. The demand for coke for steel melting purposes is more active than that for use in blast furnaces.

### Machine Tool Makers.

The majority of the machine tool makers report an improving trade, and the makers of high-speed tool steel are very actively engaged. Messrs. Francis Berry and Co., of Sowerby Bridge, are just introducing an improved motor-driven plate-edge planing machine, which is certain to attract a good deal of notice. The Low Moor Ironworks are very fully employed for the moment in the machine tool department of their business. The principle orders received are for boring and turning mills, high-speed planers, milling machines, boiler shell drilling machines, and lathes. Bateman and Co. are building one or two special high-speed planers, and Messrs. Fairbairn Macpherson are just completing some special tools for ordnance work. The general tone of the reports received indicate a period of improving prosperity for the industry, and it is not surprising to note that one or two new companies have been registered with objects pointing to their advent in the machine tool trade.

### Rolling Stock Orders.

Reference has been made to the greater demand for railway material, and the Leeds Forge Co. have on hand a curious type of wagon, intended for service on a private line in Egypt. The wagon is to have a length over buffers of 33 ft. 7 in., a length over headstocks of 31 ft., a width of 10 ft. 6 in., a buffer height of 2 ft. 8½ in., and a floor height of 3 ft. 14 in. The bogie wheels will be 2 ft. 4 in. in diameter, the bogie wheelbase 5 ft. 6 in., and the centres of the bogies will be 22 ft. apart. The wagon is to be provided with an end ramp—this having a length of 10 ft. 11½ in., and a weight of 19 cwt, hinged on to the end of the headstock of the underframe, which can be lowered on to the rails. This type of wagon is to be used for the transportation of steam ploughs and heavy machinery.

### Donauster Sewerage Scheme.

The Local Government Board having approved the scheme of main sewerage and sewage disposal for Bentley, with Arlsey, Donauster, a contract for the work has been let to Messrs. J. J. Mackenzie and Sons

Edinburgh. The works consist of the laying of nine miles of main sewers, and of cast-iron and fireclay pipes; but, owing to the water-logged and flat nature of the ground, deep sewers cannot be laid, and the district has had to be divided into three sections, each with a separate pumping station. It is proposed to pump the sewage from a small storage tank by means of centrifugal pumps worked by electric motors. A central generating station is to be erected at disposal works near Bentley, from which the necessary cables will be laid to the three pumping stations. To deal with the night flow, power will be obtained from a storage battery. The motors at each pumping station will be started and stopped by means of floats, automatically operating the switches, so that the whole pumping plant will be worked from the central station. The sewage will be delivered at the disposal works, and treated in bacterial tanks and filters, with final treatment over land. The works have been designed by Messrs. D. Balfour and Son, of London and Newcastle-on-Tyne.

### Coke Oven Installation.

At the Manvers Main Colliery a new coke oven installation has been made by the Kopper's Coke Oven and By-Product Company, of Sheffield, which consists of thirty-six ovens 33 ft. long by 6½ ft. high, each taking a charge of 7½ tons of coal, giving a total output of 1,000 tons per week. The installation also includes a by-product plant, coal-devolating, crushing, and storage plant, automatic charging apparatus, and tanks for storing tar and ammoniacal liquor. The whole is driven by electricity, the power station containing two 140 kw. three-phase generating sets.

### Hadfield Steel Foundry.

At a meeting of the Hadfield Steel Foundry on Monday, Mr. R. A. Hadfield pointed out the lines on which success, such as is exhibited by his own company, may be repeated by other engineering firms. It is all a question of equipment and system. Mr. Hadfield claims that his company has the finest shops in the world, and by devoting attention to research work, is able to open up new branches of business. It was often said that English engineering shops compared unfavourably with American establishments, a doctrine to which he did not subscribe. He was not afraid to face American competition, and was doing it now with very satisfactory results. One of the secrets of the company's success was that they knew the exact cost of everything they made. That was half the battle, and if all firms did the same there would be less of the present insensate competition.

### Coming-of-Age Presentation.

Next on should be made of the occasion of the employees and heads of Messrs. W. Summerscales and Son, Ltd., in honour of the coming of age of Mr. H. C. Longsdon's son, Sirlo. Mr. Longsdon, sen., had one or two timely remarks to make on the relations between capital and labour, and the necessity for harmonious relations between an employer and his workpeople. Mr. Matthew Walker, the oldest employee of the firm, made the presentation of a gold hunter watch to Mr. Henry Serlo Longsdon, and Mr. Robson and Mr. Cope gave expression in appropriate terms to the good feeling that existed between the employees and principals.

### Leeds Electric Lighting Department.

An interesting report on the Leeds electric lighting undertaking has been presented by Alderman Ewing Matheson, in which the whole position is admirably summarised. It will be remembered that there has been some discussion upon the difference between the real and present book value of the assets, and the chief causes of the difference are stated in the report. They may be summarised under the following heads:—Assets destroyed or discarded; wear and tear of plant still in use; out of date plant still in use; reduction of market prices of plant since date of purchase; and premium on cost of undertaking, etc. The conclusion is that the sums taken from the undertaking for the relief of rates, £16,000, were not properly so applicable, but it is probable that if this amount, with interest, is refunded and no further sums overdrawn, that the undertaking will be able to meet all its obligations. The reconstruction of the

plant of a considerably increased capacity. Mr. Matheson has estimated the cost of this reconstruction at £230,000, towards which he anticipates that a sum of £30,000 will be obtained by the sale of the old plant. Supposing the scheme to be approved, it is recommended that application be made to the Local Government Board for sanction to the borrowing of £120,000, and that the remainder of the cost be carried to "extraordinary renewals" account, and that the amount in the reserve or equalising fund, together with any surplus, be transferred to the credit of the renewal account when the position of that account renders such transfer necessary. It is pointed out that current has been sold by the undertaking at from 12d. to 2d. per unit for power, and that the motors installed on customers' premises now aggregate about 5,000 h.p.

## Lancashire District.

### MANCHESTER

#### Engineering Works well Employed.

There is everywhere a feeling as to be able to meet demand for pig iron, but engineering works generally are still well employed. The suggested railway extensions in the neighbourhood of Manchester, and additional cotton mill building indicate fresh work for engineers and machine tool makers. An event of some local interest at Manchester is the fact that the laying down of a projected tramway in connection with the engineering works of Messrs. Armstrong, Whitworth and Co. has been temporarily checked, and unless some means are taken to overcome the difficulty, there is a prospect that a good deal of that firm's work now done in Manchester will be transferred. It is hoped matters may be arranged. The shipbuilding firms, both at Barrow and Birkenhead, are well employed. The work in progress at the yard of Messrs. Cammell, Laird and Co. includes a 33-knot torpedo-boat destroyer for the British Government, and high-speed turbine steamers for the Great Western Railway Company's Irish service and the Great Central Railway Company's North Sea service. The Lincolnshire Ironmasters' Association have reduced the official rates to 59s. 6d. delivered Manchester for No. 3, and 47s. 6d. for No. 4 forge delivered Warrington. The coal trade is more active, and the majority of the iron works are working at full capacity.

#### Machine Tool Trade.

In this district also the firms engaged in the industry are being compelled to make workshop extensions. In this connection mention may be made of the new erecting shop and other additions made by Messrs. Tinsley and Sons, of Patherley. Messrs. Thos. and Co. report the receipt of order for their specialities, and Messrs. George Richards and Co., of Broadheath, have received orders for their planing machines. This firm's side planing machine is made to plane from 2 ft. to 30 ft. long and from 12 in. to 48 in. wide, or by turning the work round, 24 in. to 66 in. The machines are designed for use with modern high-speed cutting steels. The return stroke is 80 ft. per

minute, and the cutting stroke anything up to 40 ft. Reference has been previously made to the measuring machine and limit gauges of the Newall Engineering Co., Ltd. The internal micrometer of this firm has the advantage that it is as easy to measure accurately an internal dimension as an external dimension with an external micrometer. The standard end measuring rods are planned to be accurate to length within one ten-thousandth of an inch. A tendency to be noted is the present demand for pneumatic tools, and with the great improvement of trade in the Manchester district fresh workshop equipments are certain to be called for, so that the demand for such tools is increasing.

#### Demand for Locomotives.

At the annual general meeting of Beyer, Peacock and Co. the chairman referred to the conditions in the locomotive trade. He said that there were adverse conditions which should not be ignored, and which were not altogether favourable to the British trade. He was, however, interested in the steam locomotive trade. In the home trade, by the introduction of electricity, a considerable number of a certain class of engine, in a more or less state of fitness, had been thrown on the market. Again, as regarded the overseas trade, the state of affairs in the Colonies and distant non-protective countries was always a matter of much concern. It was earnestly to be hoped that nothing would occur to check the rather slow revival of trade and enterprise in South Africa. Again, the long war in the Far East had left Japan, which in the past had been a good customer to England as well as to America, in a somewhat serious plight. Beyond all that, all English firms had in distant markets to reckon with the competition of German manufacturers, who, being favoured with an export bounty by their Government, had a margin to their credit of some £600 to £800 per engine, against which, if cheapness was to be the only test for selection, it was not possible for British firms to contend with success.

### Dock Improvements at Barrow.

Messrs. Vickers, Sons, and Maxim have come to terms with the Furness Railway Company for the widening of the entrance to the Blackpool Dock from 80 ft. to 160 ft. This is a big undertaking, and the cost will be very heavy, but the work is essential as a means of enabling Messrs. Vickers to undertake the building of the larger class of vessels which are being constructed to-day, including warships and ocean liners up to 85 ft. in width. The Barrow men have just completed a shipway of which a vessel 1,000 ft. long can be built, and they are considerably extending their fitting-up berths, and fitting down new electric cranes capable of lifting 500 tons.

### New Coal Tips at Garston Docks.

Two hydraulic coal tips have just been manufactured for the London and North-Western Railway Company, and erected at Garston Docks. They are each designed for lifting or lowering, with a hydraulic pressure of 7½ lb. per square inch, a coal wagon of the gross weight of 30 tons through a height of 30 ft., and the lifting rams and their valve gear are so arranged as to give two lifting powers.

with the object of enabling the tip to lift or lower loaded wagons or empties with the greatest possible economy of pressure water. The wagons are taken on and off at a level of 25 ft. above the quay level, and can be tipped and discharged at any level between 5 ft. and 35 ft. above the quay level. The manufacturers are the Hydraulic Engineering Co., Ltd., of Glasgow.

### Cable for New Cunarders.

One of the latest cables made in New York is a three-link sample of the cable for the new Cunard express steamer now being built by Messrs. Swan, Hunter, and Wigham-Richardson on the Tyne. The links are made of 3½ in. diameter iron, and are 22 in. long and 13½ in. wide. Each link weighs 170 lb. A similar sample of the cable (also exhibited) has been tested at Lloyd's Proving-house at Netherton to the licensed limit of the testing machine, 250 tons, but the actual stress was over 370 tons. After this severe strain the links showed no sign of fracture, although they stretched six inches. The total length of the cable for the steamer is 1,000 ft., and its weight, with the connecting shackles, is about 130 tons.

## The Midlands.

### BIRMINGHAM.

#### Birmingham Iron Trade Meeting.

The attendance at the weekly meeting was rather over the average, but it cannot be said that the tone was any stronger by reason of the larger attendance. In some directions there was a disposition to believe that bottom had been touched in the Cleveland iron market, and an attempt was made by local makers of pig to take advantage of this fact in the way of enhanced quotations. It was at once evident however that no business could be done at these higher quotations, and consumers were practically able to dictate terms. In the finished iron department there is still a complaint indeed that pig iron could stand at a higher price. It is pointed out that the rise in quotations, which dates from the end of last year, carried the price of pig iron some 15s. above the old level, and the fall from this top price has been too little to give the producers of finished iron any real assistance in meeting the strenuous competition which they now have to face. The focus of this competition is in Belgian material, which is becoming a distinct menace to local makers. There is no getting away from the fact that Belgian bars can be bought to be delivered into the Midlands at about 2s. less a week of course, than a much cheaper quotation than that for local iron used for similar purposes. Some makers are quoting common bars at £6 15s., and where a good order is in question are even prepared to go a shade under this price. The quotation for Cinder pigs have been maintained at recent rates, but Northamptonshire makers have quoted at 10s. and Derbyshire makers at 10s. 6d. North Staffordshire makers are fairly full of orders, and are looking off for better prices. German competition in steel is not much in evidence. Sheet bars are quoted at 2s. 10s. with little business, but the direct trade

itself is quieter, although Welsh makers have been in receipt of some good orders lately. Black sheet makers are inclined to make concessions in price, and at the last market doubles were quoted at £8, or a shade under. There was not, however, much business in evidence at these quotations. There is some complaint on the part of galvanisers of scarcity of work, and in spite of the work of the Association, it seems tolerably certain that production is again outstripping demand. The Association price of £12 7s. 6d. is still quoted, but it is very doubtful indeed if this price can be maintained, in view of the statistical position.

#### Midland Trade.

The engineering branches generally are steadily employed, and the rolling stock companies in particular have sufficient orders in hand to keep their activities engaged for some considerable time to come. The majority of these orders are on foreign or colonial account, the home railway companies showing a disposition to wait events. The value of the trucks sent abroad last month certainly compares very favourably with the figures of a year ago, being £240,350, against £191,063. Structural engineers are also well employed, and the motor manufacturers are working at high pressure. In Wolverhampton the heavy trades are steadily active, iron foundries having secured good orders recently, and the general engineering trades are well employed. The bridge builders and the firms engaged in constructive work are on full time, and the boiler trade is fully engaged.

#### Machine Tool Trade.

The firms engaged in the trade in this district are fairly well employed, and attention may be directed to the fact that the Birmingham and



Hutchinson, of Cardiff, the latest series of universal lathes, which are designed to provide the rapid cutting of tools and screws, thus providing the power necessary for machining right up to the breaking point of the material being cut.

Another machine of recent design is a two-speed radial drilling machine, by Messrs. Archdale and Co., Ltd., which is illustrated and described in this issue (see page 64). This firm makes a speciality of radial drilling machines 2 ft. 6 in. to 6 ft. radii, for which there is a large and increasing demand. During the last three or four years the firm has supplied more than such machines, the present time will be increased with orders of various sizes. An extension of the works is contemplated. The Forge Tool and Electric Works are mostly engaged in high-speed lathes and screw-driven tools, and, as already stated, are arranging for driving the whole of the shops by electricity.

Messrs. Webster and Bennett have some heavy orders on hand, including vertical profiling machines for the Russian Government and lathes for New Zealand, the Indian Government, and Chili. To the order of the War Office they are making special boring and turning mills, fitted with drill head. Other work in course of completion include multiple spindle drills for a number of well-known firms, and a number of 30 in. and 14 in. double boring and turning mills.

#### Steel Tube Trade Discounts.

It is announced in Birmingham that the movement for effecting a combine in the steel tube trade has reached a practical stage, and it is proposed to reduce discounts in April to a uniform level. At present discounts on cycle tubes range from 75 to 85 per cent., and on boiler tubes and bedstead tubes the discounts are about 5 per cent. less. It is intended to reduce the discounts by 10 per cent., which would mean a substantial advance in prices. An international arrangement is contemplated.

#### Dudley District.

The local industries are actively engaged, ordinary sizes of rounds, squares, and flats being in steady request, while a satisfactory trade is being transacted in bolt rods and nut bars. Mild steel descriptions of rivet bars enjoy a fair sale, and there is a steady flow of orders for axle and link-rod iron, while guard-iron

and spliced bar sections appear to be selling well. Shoe iron and tyre iron are steady, and angle and tee sections are brisk, while in mild steel descriptions

it may be noted in best cable rounds, but there is a steady demand for ordinary qualities, although half-rounds

and electrical and hydraulic engineers are working

#### Fire-Boat for Gloucester Docks.

Orders for a new steam fire-boat with Messrs. Merryweather, of London. This boat will have neither screws nor paddles, but will be provided with nozzles fitted to the sides of the boat, fed with water from

can be thrown forward or aft. A going-ahead speed of 4 to 6 miles per hour will be obtained. The vessel

the draught aft will be only 3 ft. It will be fitted with a Merryweather water-tube boiler and an oil-fuel heater, so that low-pressure steam will be maintained day and night, and full pressure for working will be obtainable within five minutes from an alarm. The pumps, which will deliver 1,000 gallons of water per minute, will be of the vertical "Gem" type, and will enable one large or a number of smaller jets to be thrown at once. Suction will be arranged from either side of the vessel, so that when working in shallow water the pumps can draw from the deeper side. The vessel will be built of steel.

#### Birmingham Tramway Construction.

The electrification of the steam routes of the City is proceeding rapidly, and in connection with the change new routes will be opened up. The work is well up to time, and on January 1 next the existing steam cars will be replaced by electric cars in every part of the system. Sir John Aird and Son have the constructional work in hand, and simultaneously Messrs. Dick, Kerr and Co. are engaged in the construction of the overhead equipment required for the new lines as well as for those already in existence.

## Wales.

#### SWANSEA.

#### Trade Tendencies.

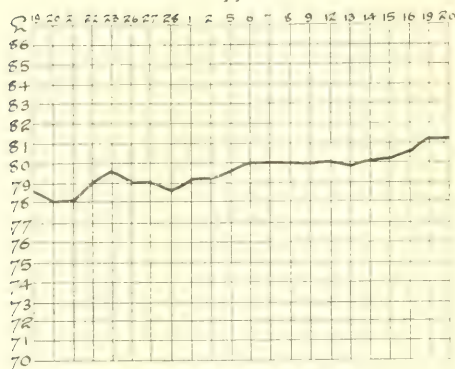
There is a lull in the tinplate trade, and the iron and steel trade is no better than steady, although there is a natural disposition to make the most of the proposition to establish new works in South Wales, concerning which the Government of Wales and that definite has been decided. The principal reasons for the depression in the tinplate trade are the high price of raw material, the absence of new business, and the unremunerative prices offered. Some works are already stopped, and there are rumours of several others being likely to follow this example. The bright

dwindling supplies. Some steam descriptions are commanding from 25 to 35 above their normal values at Cardiff, Swansea, and Newport. There has been an average rise in prices of from 15 to 25 per cent., according to qualities, and with the demand still in excess of the supply there are prospects of a still further advance. The French demand is also affecting large coals, but the rise in large qualities, although appreciable, is infinitesimal compared with the jump in smalls. Anthracite descriptions have not yet participated in the improvement. Semibituminous prices are firm, and patent fuel manufacturers are asking higher prices. A large contract is to be placed by C&A for semibituminous large coal.

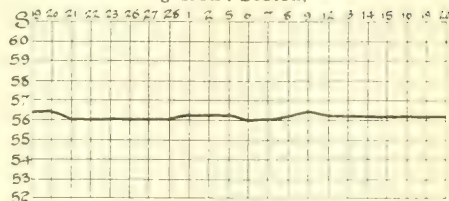
# The Home Metal Market.

Showing Daily Fluctuations from February 19th to March 20th, 1906.

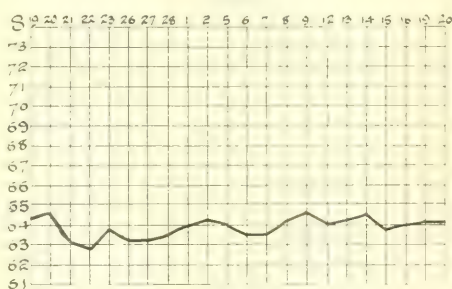
Copper.



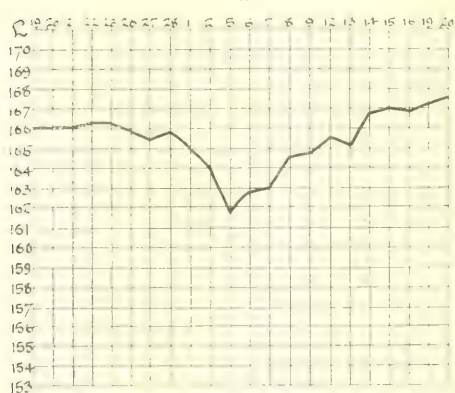
Pig Iron : Scotch,



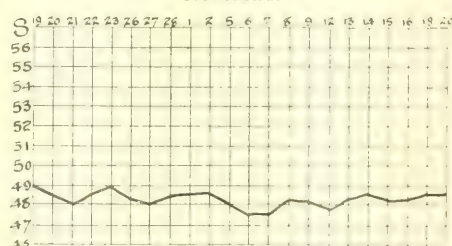
Hematite,



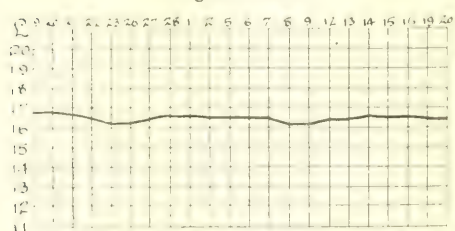
Tin.



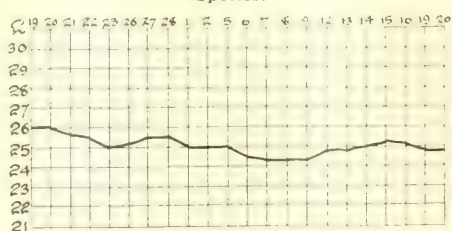
Cleveland.



English Lead.



Spelter.



# Contractors' News.

For particulars of other contracts, see recent issues of "Page's Weekly," and small advertisements, pages 6 and 7. We shall be pleased to insert under this column, free of charge, particulars of open-contracts. While every care is taken to ensure the accuracy of the information given, no responsibility can be taken for accidental errors or omissions.

## Contracts Open.

### United Kingdom.

**Ballymena.** Supply of water to the town.

Mr. J. H. O'Hara, town clerk, Ballymena

**Bolton.**—The Electricity Committee invite tenders for one continuous current electric generator

Mar. 29

**Bolton.**—Supply of one steam engine complete, for the town of Bolton. Mr. A. Day, A.M.Inst.C.E., M.I.E.E., borough electrical engineer, Spa Road, Bolton

Mar. 29

**Bournemouth.** Construction of a new pier on the West Cliff, waiting rooms, construction of track, and other works in connection therewith, for the Town Council. Mr. F. W. Lacey, M.Inst.C.E., borough engineer and surveyor, Market Street, Bournemouth

Mar. 29

**Briton Ferry.**—Supply, delivery, erection and laying of sub-station switchboard, non-rubber feeder and distributor cables, feeder pillars, joint boxes, arc standards, arc lamps, etc. Messrs. Herbert Lewis and Fletcher, consulting engineers, Prudential Buildings, Birmingham

Mar. 29

**Brixham.** Supply, delivery, and erection of about 4½ miles of 7-in. and 5-in. cast-iron water mains, together with the requisite sluice valves, air valves, meter, washouts, and other fittings, the construction of a service reservoir, boundary walls, meter-house and store for the Urban District Council. Mr. Fred. William Vanstone, Palace Chambers, Paignton

Apr. 6

**Caithness.**—Construction of a small break-water at the Bight, St. John's Point, near East Mey, Caithness (about 300 cubic yards of concrete). Mr. James Young, Council Clerk, Thurso

Mar. 24

**Chapmanslade.** Construction of a new service reservoir, and the providing and laying of 97½ lineal yards of 3 in. and 4.078 lineal yards of 2 in. cast-iron mains, with valves, fittings, etc., for works of water supply for the village of Chapmanslade, Wilts, for the Warrminster and Westbury and Whorwells-down Rural District Council. Mr. W. H. Stanley, A.M.Inst.C.E., engineer for the Warrminster and Westbury and Whorwells-down Rural District Council

**Chester.**—Construction, alteration, electrical works, and laying of new length of track in car shed. Mr. J. H. Dickson, Town Clerk

Mar. 31

**Chingford.** Construction of a new pumping station, sump, and hydrostatic tank, at their sewage works, Chingford. Mr. Walter Stair, Council Offices

Mar. 24

### Chippenhams.

sewage pumping station, Chippenhams, for the Urban District Council. Mr. A. L. Adams, A.M.I.M.E., borough engineer, Chippenhams

### Edinburgh.

cast-iron pipes, from 2 in. to 15 in. in diameter

**Epsom.**—The Asylums Committee of the L.C.C. invite tenders for the installation of electric lighting and power (excluding generating plant)

### Gillingham.

**Grangemouth.** Construction, completion and maintenance of the works of equipment of the quays of the new dock extension at Grangemouth, for the Caledonian Railway Co. Secretary, Caledonian Railway Co., 3-2, Buchanan Street, Glasgow

Mar. 28

**Greetland.**—Construction of bacteriological tanks, filters, carriers, and other appurtenant works at Greetland, for the Greetland Urban District Council. Messrs. R. E. W. Berrington and Son, Bank Buildings, Wolverhampton

Mar. 31

**Haslemere.**—Supplying and erecting pumping machinery capable of raising 3,000 gallons per minute, for the Hambledon Rural District Council. Messrs. R. B. Grantham and Son, 23, Northumberland Avenue, London, W.C.

Mar. 25

**Hythe.**—For the sinking of a well at Bluehouse in the Parish of Saltwood, and lining same with brickwork and cast-iron cylinders. Mr. J. H. Kent, Hythe, Kent

Mar. 24

**Leeds.**—Tenders for one or two sets of electric generating and condensing plant, each comprising a steam turbine, two-phase alternator and exciter of 3,000 kw. capacity, electrically driven surface-condensing plant, and the necessary pipes and valves. Mr. Harold Dickinson, 1, Whitehall Road, Leeds

Apr. 9

**London.** The County Council require high and low tension switchgear for certain sub-stations

**London.**—Supply and erection of three 10-ton hand cranes, for the L.C.C., County Hall, Spring Gardens, S.W.

Mar. 27

**Norwich.** Heating and hot-water supply work at the extensions of the City Asylum, Hellesdon, near Norwich. Arthur E. Collins

### Smythwick.

shunting purposes, for the Gas Committee, Mr.

Smythwick

Mar. 29

**Selly Oak Birmingham.**—The Corporation are in the process of erecting a new bridge over the existing bridge well at the Tenthredin Road. It is the Selly Oak and the Kings Norton and Northfield Urban District Council. Surveyor's Office, 23, Valentine Road, King's Norton.

**Stockport.**—Electricity supply. The Corporation are in the process of erecting a new condensing plant for the electricity department.

**Stoke-on-Trent.**—The Corporation invite tenders for electricity meters. Borough Electrical Engineer.

**Sunderland.**—For one 750 kilowatt triple-expansion engine, direct coupled to three-phase generator, 5,000 volts, with exciter, one 300 kilowatt static transformer, and two portable air-compressors.

**Walsall.**—The Corporation require a 500-h.p. high-speed engine with 1,000 volts, 100 ampere current dynamo, high-tension feeders, and low-tension distributors and pilot wires.

# Abroad.

**Adelaide.**—Supply of the following materials, delivered in bond, on wharf, Port Adelaide, wharfage to be paid by the contractor: 33 best mild steel boiler plates; 10 best mild steel smokebox tube plates for flanging (eight drawings, 18. each); 10 copper tube plates, flanged (five drawings, 18. each); 1,450 solid drawn best toughened copper tubes; 100 solid drawn best copper pipes; 200 solid drawn best copper fittings (one drawing, 18.); 12 best steel straight axle forgings (one drawing, 18. 6d.); 110 bars channel steel (two drawings, 18. each); 93 bars angle steel (two drawings, 18. each); 340 mild steel plates; 150 ft. of iron chain; 300 private locks (one drawing, 18.); 281 solid drawn mild steel tubes. Agent-General for South Australia, 28, Bishopsgate Street Without, London.

**Canaries.**—Construction of a new pier and the port of Arrecife, Island of Lanzarote, Canary Islands. The estimated cost of the pier is £32,000.

**Caen (France).**—The Prefecture of the Seine offers for laying and working a tramway line a tract of land, situated in the commune of Caen, to the Prefecture of the Seine.

**Chile.**—It has been decided to postpone the opening of the tenders for the Valparaíso dock scheme until.

**Egypt.** Supply and erection of an electric light and traction system (14 H.P. 220 volts) for the Port of Suez. The estimated cost of the scheme is £10,000. The contract is to be awarded to a suitable engine coupled direct to a 51 kilowatt dynamo, including switchboard, instruments, wiring, lamps, switches, fuses and ventilators. Agent-General for the Port and Light, Suez, Alexandria Canal.

**Johannesburg.**—The Corporation are in the process of erecting a new bridge over the existing bridge well at the Tenthredin Road.

Last Day.

Mar 27

Mar 28

Mar 31

Mar 30

Mar 30

April 2

April 7

June

April 23

April

May 2

**Egypt.**—The Corporation are in the process of erecting a new bridge over the existing bridge well at the Tenthredin Road. It is the Selly Oak and the Kings Norton and Northfield Urban District Council. Surveyor's Office, 23, Valentine Road, King's Norton.

**Lisbon.**—Construction of iron bridge (about 200 ft. long) Direccao de Minho e Douro.

**Lisbon.**—Construction of a metal bridge over the river Mondego, at Martyr Santo. Ministry of Public Works Lisbon.

**Lisbon.**—Construction of a metal bridge over the river Velho or Verride. Ministry of Public Works Lisbon.

**Madras.**—The Madras Railway Company require tenders for the supply and delivery f.o.b. of bar iron, steel sheets, plates, wire, zinc and tin sheets, copper and brass sheets and wire, anvils, hammers, vices, crowbars, spanners, bellows, files, etc. The Company's office, 1, Broad Street Place, Finsbury Circus, E.C.

**Madrid.**—The Direccion - General de Obras Publicas invite tenders for an electric railway project in Barcelona.

**Madrid.**—Concession for an electric railway in Madrid, Directorate-General of Public Works.

**Manila.**—Construction of two steel breakwaters, Hecla Works Manager.

**Montevideo.**—Complete installation of Cerro de Montevideo lighthouse, of nine gas-lit buoys, and of gas works. Ministerio de Fomento.

**Namur.**—The Municipal Council of Namur (Namur) are inviting tenders for the electric lighting of the town. Secrétariat Communal.

**Prague.**—Construction of a standard gauge local railway from Libochowitz to Jenchowitz. Conditions may be seen at the railway department offices in Prague. Kleinseite, Thomas.

**Rosario.**—Public electric lighting. Municipal authorities, Rosario, Argentine.

**Rotterdam.**—The Netherlands Colonial Office at The Hague require tenders for the supply of the following materials: Contract 414—The metal superstructure with appurtenances for a new bridge over the canal, between the Port of Rotterdam and the Port of Amsterdam. Agent-General for the Port and Light, Suez, Alexandria Canal.

**Sydney (New South Wales).**—Supply and erection of (a) boilers, automatic stokers, pipe-work etc.; (b) turbo-alternator, sub-station etc. The contract is to be awarded to a suitable engine coupled direct to a 51 kilowatt dynamo, including switchboard, instruments, wiring, lamps, switches, fuses and ventilators. Agent-General for the Port and Light, Suez, Alexandria Canal.

**Talcahuano.**—Construction of floating steel dock of 1,000 tons displacement. Direccion del Material, Valparaíso.

Last Day.

April 2

May 23

April

April 1

Mar. 26

Mar. 31

April 22

April 3

May 1

April

Mar

April 27

April 4

May

May 2



## Coming Contracts.

**Blackrock Ireland.**—An inquiry will be held relative to the proposed Blackrock waterworks and sewage disposal works.

**Chatham.**—The Board of Public Works has submitted to the borrowing of £2,500 for extensions to the pier.

**Cuba.**—It has now been decided to submit to the expenditure of (1) \$700,000 on public works, mainly road and bridge construction, in the provinces of Pinar del Rio and Habana; (2) \$100,000 on dredging and other improvement works at the Port of Isabela de Sagua; and (3) \$50,000 on studying the best means of preventing the floods periodically caused by the overflowing of the Roque.

**Guildford.**—The Town Council are taking up bonds on interest of £2,500 for the extension of water supply.

**Halifax.**—£730 is to be expended on additional electrical laboratory apparatus.

**Hammersmith.**—The Borough Council have resolved to take up a loan of £15,210 for extending the electric lighting system.

**Ilkeston.**—An inquiry will be held relative to the expenditure of £27,000 for the purposes of sewage disposal was held recently.

**Italy.**—A law has been published authorizing the Reggio Emilia Provincial Council to construct and work a steam railway between Reggio Emilia and Ciano d'Enza.

**Leyton.**—An inquiry was held recently relative to the application of the Urban District Council for a loan of £21,100 for the extension of the electric lighting station and the provision of additional plant to supply power for working the tramways.

**Llanelli.**—An inquiry will shortly be held into an application for a loan of £10,000 for the extension of the electric lighting.

**Minster (Sheppy).**—The erection of a pier 7,000 ft. in length has been sanctioned by the Board of Trade.

**Naples.**—The use of automobile boats has spread very much at Naples, and is capable of indefinite development. For pleasure purposes they are much more convenient than steam, and in the summer weather they are safe enough for all practical purposes of coasting and running over to the islands, which is the main object of owners of craft of the kind. The great difficulty in Italy is the heavy cost of the petrol, owing to the duty placed upon it. This retards the development of automobilism throughout the country.

**Newcastle.**—On Friday last an inquiry was held into the City Council's application to borrow £14,000 for a new waterworks.

**Romford.**—An inquiry will be held relative to the expenditure of £2,850 for works on the sewerage and private street works.

**Russia.**—The projected direct railway system from Russia to America, via a tunnel under the Behring Straits, is receiving attention from an American syndicate.

**Salford.**—The local authorities are about to seek power to borrow £7,750 to cover the cost and installation of a new turbo-generator and condensing plant at the Frederick Road generating station.

**South Africa.**—The Borough Council of King William's Town, the Municipal Council of Woodstock and the Council of the municipality of East London, will shortly apply for parliamentary powers for various schemes in connection with supplementing the water supply in the town named.

**Southwold.**—The Urban District Council are desirous of carrying out sea-defence works, and following an application to the Local Government Board for permission to borrow £2,500, the usual inquiry was held recently.

**Spain.**—H.M. Consul at Corunna states that more orders for steam trawlers are to be placed, and possibly larger trawlers may be wanted for the cod fisheries.

**Stafford.**—Owing to the increase in the demand for electricity, it has been decided by the Council to purchase additional land and equipment for the extension of the system.

**Sunderland.**—A Local Government Board inquiry was held last week at Sunderland into an application by the Corporation for sanction to the borrowing of £18,000 for extensions to the electric lighting works.

**Wem.**—Borrowing powers to the extent of £5,000 are being sought by the Urban District Council. The money is required for carrying out a scheme of sewerage and sewage disposal.

**Weymouth.**—The Corporation are negotiating a loan of upwards of £10,000 in connection with the borough electric lighting scheme.

**Wolverhampton.**—The Corporation are about to construct an aerial ropeway to the waterworks station at Cosford at a cost of £1,050.

**Yeovil.**—A sum of £1,000 is required for purposes of sewerage works, and a loan of £1,000 has been granted by the Yeovil Corporation for the purpose. The usual inquiry was held recently.

## Contracts Closed.

**Australia.**—The Electric Lighting and Traction Company, of Australia, Ltd. (Adelaide Electricity Supply), have placed an order with Messrs. Witting, Eborall and Co., Ltd., for two 115-kilowatt motor-generator sets, converting from low pressure continuous current to single-phase high-pressure alternating current.

**Bombay.**—Messrs. Witting, Eborall and Co., Ltd., have supplied to Messrs. Greaves, Cotton and Co., of Bombay, India, the equipment of five cotton spinning mills, including the generating plant and switchboards, together with all lighting fittings and accessories.

**Bristol.**—The Electrical Committee has accepted the tender of Messrs. Siemens Bros. and Co., Ltd., for extra high-tension cables, for £7,887.

**Burnley.**—The Corporation Electricity Committee has accepted the tender of the British Thomson-Houston Co. to supply motors and starters for the ensuing twelve months, and also the supply of armoured cable, of Messrs. Siemens Bros. for the supply of armoured cable.

**Cardiff.**—The Corporation have secured the contract for the new asylum buildings.

**Clyde.**—The Clyde Bridge Company have secured the contract for the new bridge over the Clyde.

**Colchester.**—The British Thomson-Houston Company have placed the orders for 10 single-deck bogie composite carriages, 15 single-deck open carriages, for the Rangoon Tramways, with the Brush Electrical Engineering Company, Ltd., Belvedere Road, S.E.

Messrs. Dick, Kerr and Co., Ltd., for the supply to two

**Derby.** The Chain Belt Engineering Company have recently installed a coal-handling plant at the extensive Manningham Mills of Lister and Co., Ltd., Bradford, second boiler-house plant for the same mills. The Derby firm also have in hand a complete coal elevating and conveying plant for the Grimsby Corporation Electricity Works.

**Fulham.**—The Borough Council has accepted the following tender of Aiton and Co., Ltd., Willesden Junction, to supply water and exhaust piping for electric lighting

**Gourock.**—Mr. James Adam, yacht builder, Gourock, has been commissioned by the Arrol-Johnston Motor Company, Paisley, to build two 35 ft. motor launches.

**Granton.**—The Scottish Motor Engineering Company, Granton, report that they have been successful in obtaining orders for "Granton" motors on the stipulation that they are "all British" made throughout, to the

**Leeds.** The High Commissioner of New Zealand has accepted the tenders of Messrs. W. Johnson and Sons, of Armley, Leeds, for briquette making plant for the State coal mines in that colony at a cost of £3,430, and for a Hatley double-cylinder non-compound high-pressure engine complete with condenser, at £405.

**Levenshulme, Manchester.**—In connection with the Swanscombe Works of the Associated Portland Cement Company, Ltd., Messrs. Mason's Gas Power Company, Ltd., have received instructions to proceed with the erection of a 2,400-h.p. bituminous coal gas power plant required to work in connection with seven Oechelhauser gas engines of 350 h.p. each. The gas plant will consist of three gas generators, each of 800 h.p., with the necessary cooling and cleaning plant. The successful results obtained on the 1,800-h.p. plant at the works of the Reading Electric Supply Company, Ltd., was probably a large factor in Mason's Gas Power Company securing this important contract from the Cement Company.

**Loughborough.** The Brush Electrical Engineering Company, Ltd., report that they have secured the following contracts: Dublin, Wicklow, and Wexford Railway Two motor-coach bodies; South London Electric Supply Corporation 60-kilowatt motor-generator; Croydon (per British Westinghouse Company)—15 single-deck motor-coach bodies; Great Eastern Railway 800-h.p. gas engine; Great Eastern Railway 200-h.p. gas engine; extension permanent way, overhead line, and cables; Gosport and Fareham Tramways Co. 3 double-deck cars with trucks and Brush motor equipments; Portsmouth and Hordean Light Railway Company —2 double-deck cars with four-wheel trucks.

**Newcastle.** The Stirling Boiler Co., Ltd., have received a repeat order from the Newcastle and District Electric Lighting Co., Ltd., for two large Stirling boilers, each of 5,770 square feet of heating surface, fitted with chain-grate stokers and superheaters of their manufacture.

**Poole.**—The Town Council have accepted the tender of the Brush Electrical Engineering Company, Ltd., for the construction of the new electric tramways at £26,108,

**Rangoon.**—The British Thomson-Houston Company have placed the orders for 10 single-deck bogie composite carriages, 15 single-deck open carriages, for the Rangoon Tramways, with the Brush Electrical Engineering Company, Ltd., Belvedere Road, S.E.

**Servia.**—It is reported that the Servian contracts for guns to the amount of £1,600,000 have been given to the French firm of Creusot.

**Sunderland.**—The tender of Triumph Stoker, Ltd., of London and Leeds, has been accepted for mechanical stokers for the four new Galloway boilers for the Corporation electricity works at Hylton Road.

## Appointments Vacant.

**Croydon.**—Chief lectureship in electrical engineering at Croydon Polytechnic for three evenings per week for a session of about thirty weeks. Duties to commence in September.

**India.**—The Bombay, Baroda and Central India Railway Company require a signal engineer, with knowledge of electrical engineering. Salary Rs. 500, rising to Rs. 800 per month. Mr. T. W. Wood, Gloucester House, Bishopsgate Street Without, E.C. 4.

Mar. '27

**India.**—Chemist for the gun and shell factory, Cossipore. A knowledge of steelwork and rolling mill plant is essential, and he will be required to take charge of two 10-ton open hearth furnaces and bar mill and a small ironfoundry. Salary Rs. 500 a month for the first five years, thereafter Rs. 500 a month, rising by 20 annually to Rs. 700 a month. Director-General of Stores, India Office, Whitehall, London, S.W.

**London.**—An open competitive examination for not fewer than twelve situations as assistant examiner in the Patent Office will be held by the Civil Service Commissioners in April next. Secretary, Civil Service Commission, Burlington Gardens, W.

April '23

**South Shields.**—Additional instructor for the Marine Engineering Department of the South Shields Marine School. Candidates must hold an extra first-class Board of Trade certificate, and have a sound knowledge of modern steamship auxiliary machinery, dynamos, water-tube boilers, refrigeration, etc., and must be able to lecture. Salary £120.

Mar. '27

## Appointments Filled.

**Huddersfield.**—Messrs. J. Hopkinson and Co., Ltd., of Huddersfield, have appointed Mr. Douglas Wells, M.I.E.E., of 10, Rue de la Pépinière, Brussels, to be their sole agent in Belgium and Holland for their steam and water fittings, etc.

**Newcastle.** Dr. W. A. Thornton, who has been for seven years lecturer at the Armstrong College on electrical engineering, has been appointed to the newly created professorship in that branch of science at the

**New Zealand.** Mr. W. E. Bush, borough engineer and surveyor of Sudbury, Suffolk, has been appointed city engineer of Auckland, New Zealand, at a salary of £1,100 per annum.

# Prices Current of Coal, Iron, Steel, and Other Metals.

Manufacturers' and Merchants' Quotations.

## News of the Week in Brief. Iron, Steel, Pig-Iron, etc.

Wednesday, March 28th, 1906.

**CLEVELAND iron.**—The production at the present level of warrant prices having become less remunerative, one of the leading makers has decided to blow out several furnaces and to go over to the production of basic iron instead. This and other favourable features, such as the daily diminution of stocks in public warehouses, and the production of an order for 10,000 tons (Cleveland No. 1) from the American Export Company, says Merchants' Circular, have helped to produce better feeling in the market. Bears have been in evidence, and therefore, the market has been somewhat irregular, but selling at 48s. 10d. per ton, (prompt delivery), is holding at 48s. 10d. per ton, (prompt delivery), and three months 50s., but indifferent advices from America still have some effect upon operators, and fresh bear selling was indulged in at the higher level, which brought values down again to 48s. 3d. cash. At the close, however, the feeling is again firm, closing prices being 48s. 1d. for Cleveland, and 63s. 8d. for hematite one month.

The **Copper** market has been strong on bear covering, which on some days was very active; leading values have been 100s. 10d. for prompt delivery, and 100s. 10d. for three months. Values have risen considerably, the cash price advancing from £79 2s. 6d. to £80 10s., while the three months price has advanced from £77 10s. to £78 10s. The demand from consumers continues fairly good, while India and China have been in the market for special classes of material. Reports from the United States are strong and prices for refined sorts have still further advanced. The leading producers on that side are reported to have sold largely, well into the month of June, and the demand still continues. The closing prices are £81 1s. 8d. cash, and £78 12s. 6d. three months.

**Tin** remains at a high price, and supplies are undergoing a serious shrinkage. Supplies seem quite unable to keep pace with current consumption, and reserve stocks are getting dangerously low. For the whole of last year the Straits production fell off some 800 tons, and this is followed by a similar reduction for January alone this year, according to official returns. This is a factor of importance. The latest prices are £168 cash, and £166 5s. three months.

**Lead** has been a somewhat idle market, the only feature being buying on speculative account in connection with the fire at the Broken Hill Mines. The price has risen to £21 10s. 6d. for prompt delivery.

**Spelter.**—Messrs. Rudolf Wolff, Krueger and Co., in their weekly report, say: Since our last report the market for spelter, as anticipated, has become very much firmer, and quite a good business has taken place on 'Change and for prompt delivery. As it has changed from £24 10s. to £25 10s. for prompt delivery, and £25 5s. for forward. Continental producers, who were reported to be weakening, have had good quantities again purchased from them, and the market has been somewhat firmer.

### SCOTLAND

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B.

Steel	Cast	Sheet	Plate	Bar	Wire
Cast	S	S	S	S	S
Sheet	S	S	S	S	S
Plate	S	S	S	S	S
Bar	S	S	S	S	S
Wire	S	S	S	S	S

### Manufactured Iron:

Bar	Cast	Sheet	Plate	Bar	Wire
Cast	S	S	S	S	S
Sheet	S	S	S	S	S
Plate	S	S	S	S	S
Bar	S	S	S	S	S
Wire	S	S	S	S	S

### Malleable Common Bars:

Bar	Cast	Sheet	Plate	Bar	Wire
Cast	S	S	S	S	S
Sheet	S	S	S	S	S
Plate	S	S	S	S	S
Bar	S	S	S	S	S
Wire	S	S	S	S	S

John Spencer (Coatbridge) Ltd., Coatbridge, N.B.

Bar	Cast	Sheet	Plate	Bar	Wire
Cast	S	S	S	S	S
Sheet	S	S	S	S	S
Plate	S	S	S	S	S
Bar	S	S	S	S	S
Wire	S	S	S	S	S

## Tinplates.

WALES.

## Swansea Metal Exchange quotations

[illegible]

**Messrs. Richard Thomas and Co., Ltd.,** of 33 and 35, Eastcheap, E.C. Works: South Wales: Barry, Lydney, Lydbrook, and Cwmbrilla, quote:

**Coke Tipples:**

Charcoal Tinplates :

### Charcoal Tinplates :

WORCESTERSHIRE.

**Baldwins, Ltd.** (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:-

[illegible]

Pickled, cold rolled and close annealed sheets specially quoted for.  
Extra widths, Singles to 60in., Doubles to 66in., flattens to 46in. Extra  
lengths Singles to 120ft., Doubles to 140ft., flattens to 100ft.

### Patent Coated Sheets:

	£	s.	d.	£	s.	d.
N <sub>1</sub> 1.000	1	10	0	1	10	0
S <sub>1</sub> A 1.000	0	0	0	17	0	0
N <sub>2</sub> 1.000	0	0	0	17	0	0
S <sub>2</sub> A 1.000	1	10	0	18	10	0

### Tinned Sheets

Best Charcoal (gum)	0	0	0	4	19	0
Charcoal (plastic)	0	0	0	33	16	0
EXT	4	0	0	0	0	0

Carton Can Ink Sheets 1/2" x 3 1/2" by 3 1/2" specially quoted for.  
 Imp'd Ink " Cockley K " Best Charcoal, 21/2 3/4d per box.  
 Extreme " gum Ink and Patent Gum Coal specially quoted for.  
 Lettering and signs made by " W & G " of the best and most thorough  
 for all brands.  
 At work







[illegible]

## Minerals.

Messrs S. W. Royse and Co

[illegible]

Messrs. Henry Bath and Son

Chlorine	35.453	17	71.906
Fluorine	18.9984032	9	37.9968064
Iron	55.845	26	111.690
Van. Oxide			
Lead Oxide			
Mercuric			
Calamine			
Antimony Sesquioxide			

Messrs. Barrington and Holt, Cambridge

Carbonates	0
Campanil	0
Rubio	0
	0

## Timber.

Messrs Alfred Dobell and Co, 17

## COLONIAL WOODS.

## Deals

## UNITED STATES, ETC., WOODS

Pitch Pine. 100  
 Oak Timber 100  
 Oak 14" diam. 100  
 East Hard Pine 100  
 Greenheart 100

EUROPEAN WOODS.

## Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

STOCK EXCHANGE SETTLING DAYS. — Settling days on the Stock Exchange are as follows: —

Conc. April 4th General Settlement March 28th; April 11th and 26th Bank Rate, September, 28th, 1905, 4 per cent.

## Engineering, Iron, and Steel Companies.

Engineering, Iron and Steel Companies. *Contd.*[illegible]



## Electrical Manufacturing Companies.

[illegible]

# New Patents Applied For.

## Engineering—Civil, Mechanical, etc.

- GRINDING TOOLS.**—J. E. Davis, London. Improved method of the manufacture of a composition for the manufacturing of grinding tools. 5,305.
- HAND DRILLS.**—A. E. Davis, London. An improved device for holding or supporting and rotating jumpers or hand-drills. 5,353.
- INDICATORS.**—J. Atkinson, Mellor, near Stockport. Improvements in gas or steam engine indicators. 5,341.
- INTERNAL COMBUSTION ENGINES.**—J. W. Kelly, London. A method of working internal combustion engines with crude mineral oil. 5,720.
- INTERNAL COOLING APPARATUS.**—J. W. Kelly, London. Improvements in cooling apparatus applicable to internal combustion engines. 5,801.
- LOCOMOTIVE TRACTION.**—G. H. Holden and L. S. Simpson, London. Improvements in means for lubricating axles of railway and other vehicles. 5,914.
- LUBRICATING.**—A. J. Edwards, London. Improvements in lubricating apparatus. 5,312.
- MILLING MACHINES.**—C. H. Clifton, Renfrewshire. Copying motion for milling machines or planing machines. 5,289.
- PACKINGS.**—E. J. Fuller, London. Improvements in and relating to metallic packings. 5,306.
- PACKING.**—L. A. M. Kee, London. Improvements in turbine packing. 5,777.
- PACKING.**—R. Schulz, Liverpool. Improvements in packing for rotary parts of machinery. 5,330.
- PISTONS.**—A. C. Pain and B. E. Williams, London. Improvements in pistons. 5,351.
- PISTONS.**—F. Smith, Manchester. Improvements in the construction of metallic pistons. 5,324.
- ROTARY MOTORS.**—T. M. Brown, London. An improved rotary motor. 5,861.
- SAWING METAL.**—R. Booth, London. Improvements in machinery for sawing metal. 5,321.
- SCREW CUTTING.**—The General Contracts Co. Ltd., and J. W. Kelly, London. Improvements in and relating to the mode and means of cutting gear wheels and the like. 5,320.
- GEARING.**—A. T. Collier, London. Improvements in gearing. 5,320.
- CENTRIFUGAL PUMPS.**—H. Tütöla, Liverpool. Improvements in centrifugal pumps. 5,547.
- CHUCKS.**—B. M. W. Hanson, London. Improvements in and relating to chucks for metal working machines. 5,455.
- COMBUSTION MOTORS.**—K. Petersen, Paris. Device for varying the speed of explosion or combustion motors during the working of the engine. 5,866.
- CONVEYORS.**—A. J. Boulton, London. Improvements in or relating to conveyors. 5,363.
- CONVEYORS.**—H. J. Greaves, London. Improvements in conveyors. 5,740.
- CONVEYOR BELTS.**—W. Hepburn, Manchester. Improvements in or relating to pulleys, supporting conveyor belts. 5,379.
- CUTTING TOOLS.**—C. J. Fancher, London. Improvements in driving mechanism for machines for operating abrading or cutting tools. 5,726.
- FLUID PRESSURE ENGINES.**—A. Craig, Coventry. Improvements in or relating to fluid pressure engines. 5,433.
- FLUID TURBINES.**—The Warwick Machinery Company, Ltd., London. Improvements in governing mechanism for elastic fluid turbines. 5,451.
- FURNACES.**—E. Brook, London. Improvements in or relating to furnaces. 5,648.
- FURNACES.**—J. J. Gellie, Halifax. Improvements in or relating to mechanically operated grates or fire-bars of furnaces. 5,709.
- FURNACES.**—D. R. Steele, London. Improvements in furnace structures. 5,886.
- FUSES.**—F. Knight, Macclesfield, London. Improvements in or relating to mechanical time fuses for projectiles. 5,610.
- GAS PRESSURE REGULATORS.**—K. Hillis and W. J. Hillis, London. Improvements in gas pressure regulator and in the mode and means of cutting gear wheels and the like. 5,320.

- INTERNAL COOLING APPARATUS.**—J. W. Kelly, London. Improvements in cooling apparatus applicable to internal combustion engines. 5,801.
- LOCOMOTIVE TRACTION.**—G. H. Holden and L. S. Simpson, London. Improvements in means for lubricating axles of railway and other vehicles. 5,914.
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# Weekly Synopsis of Company Meetings and News.

## Cammell, Laird and Co.

The report of the directors for the year ended December 31st last states that during the year under review the works of the company have been actively employed and the outlook is favourable. Important improvements have been carried out at the Sheffield Works. The new works at Trannere are now well advanced. It was decided that the ordnance works at Coventry, which had been equipped for the manufacture of field guns and their accessories at the date of the last report, should be further developed. A separate company, known as the Coventry Ordnance Works, Ltd., was formed to acquire the Coventry assets from the company, and half the capital therein was sold to John Brown and Co. on terms on which, in the opinion of the directors, are equitable. At a subsequent date an opportunity occurred for the company to acquire an interest in the Fairfield Shipbuilding and Engineering Company, Ltd., of Glasgow, that company acquiring an interest in the Coventry Ordnance Works. The disturbances in Russia greatly prejudiced the operations of the Russian Cammell Fire Company, Ltd., in Odessa, and, after careful consideration measures have been taken to place the concern in liquidation. The net profits for the year, after deducting depreciation and the interest on debentures and debenture stock, were £231,806. The directors recommend the following final dividends in respect of the year ended 31st December, 1905, viz.: 2½ per cent. (less income tax) on the 5 per cent. cumulative preference shares of £5 each, and 7½ per cent. (free of income-tax) on the ordinary shares of £5 each. These final dividends, when added to the instalments paid 11 October last, will make a full 5 per cent. (less income-tax) on the preference shares, and 10 per cent. (free of income-tax) on the ordinary shares for the year. This distribution on the ordinary shares shows an increase on the preceding two years, when the dividend was 7½ per cent., but in 1902 the dividend was 10 per cent. in 1903 10 per cent. and for 1904 17½ per cent.

## Vickers, Sons, and Maxim.

The annual meeting of Vickers, Sons, and Maxim was held at the River Don Works, Sheffield, on the 14th inst., under the chairmanship of Colonel T. E. Vickers, C.B. The adoption of the report and balance-sheet recommending a dividend at the rate of 15 per cent. for the year, was proposed by the chairman without remark. Alderman Eaton asked for an explanation of a sum of £137,456 written off the profits as against goodwill and patent rights, which now, he said, apparently left this item on the books of the company at £500,000. He thought the directors should give some intimation to the meeting as to how this would be dealt with in the future. The Chairman replied that the item referred to would remain at £500,000 until it was again reduced. As the second mortgage debentures had to be paid off, the amount would be written off goodwill, and as one decreased so would the other decrease. On the motion of Mr. Mikolm Hay, Colonel Vickers and Mr. Albert Vickers were re-elected managing directors for a further term of five years, and Lieutenant A. T. Dawson and G. J. B. Chetwynd were re-appointed directors. At the same time Mr. J. H. Vickers was appointed

secretary of the company. The directors also recommended that securities issued by any company with whom Vickers, Sons, and Maxim might contract for the manufacture of any article of arms or munitions.

## North British Locomotive Company.

The annual general meeting of the shareholders has just been held at Glasgow. Mr. William Lorimer, the chairman, in moving the adoption of the report, which has been published, said the directors were entirely satisfied with the results of last year's working, and they hoped the shareholders were equally satisfied. The result of the year's working was that they had a gross profit of £250,394, from which they deducted £50,000 for depreciation, and added £70,000 to the reserve fund, bringing it up to £150,000, but of the balance they proposed to pay the remaining half of the preference dividend and a dividend of 10 per cent., carrying forward a balance of £10,000. Referring to the reserve fund, he stated that electric traction was steadily superseding steam traction in suburban and underground railways, and it was a change which had come to stay. Whether there was to be a similar supersession of main line traffic was another story. His own impression was that that was a long way off yet, but it was well when they could afford to do it to prepare for the possibility of such a change, and he had no doubt they would have no difficulty whatever in meeting that new condition should it arise. Mr. Hugh Reid seconded the motion which was adopted.

## Muntz's Metal Company.

The accounts for the year ended 31st December 1905, show a gross profit of £6,389, and after deducting the interim dividend at the rate of 5 per cent. per annum on the preference shares paid for the first half of the year under review, and for having been brought down from the transfer of the reserve, a debit balance of £7,310 remains to be carried forward.

## Browett, Lindley and Co.

The accounts for the year ended 31st December 1905, after meeting debenture interest, etc., a profit of £693, thus reducing the debit balance brought down to £18,404.

## British Insulated and Helsby Cables.

The directors report that the profit for the year, together with the balance brought forward from last year, amounts to £141,016. The directors recommend the payment of a further dividend of 4 per cent. on the ordinary shares, making, with the interim dividend already paid, a total of 8 per cent. for the year ended December 31st, 1905, carrying forward to next account a balance of £100,150.

## Brush Electrical Engineering Co.

The directors recommend, subject to audit, the payment of the full 6 per cent. dividend on the preference shares and a dividend at the rate of 2½ per cent. on the ordinary shares for the year ended December 31st, 1905, amounting to £100,000, less £10,000 for depreciation reserve, and carrying forward £3,114.



**P. and W. Maclellan.**

The directors' report for the year ending December 31st, 1905, states that the credit balance at the end of profit and loss account after providing for bad and doubtful debts, directors' fees, and percentage of surplus profits due to managing directors and certain officials, and including interest on loans, was £28,734 9s. 6d. The directors recommend the payment of the dividend on the preference shares of £105,334, and a dividend of 6 per cent. per annum on the ordinary shares, absorbing £9,000; the payment of a surplus dividend of 2 per cent. on ordinary shares, absorbing £1,162 9s. 6d. The stock consists of 1,000,000 shares.

**Fairbairn, Lawson, Combe, Barbour.**

The directors state that the balance available for dividend is £105,334, and they recommend the payment of a dividend at the rate of 5 per cent. per annum on preference shares for the half-year to December 31st, 1905, the payment of a dividend at the rate of 10 per cent. per annum on ordinary shares for the half-year to December 31st, 1905, making, with interim dividend paid, 7½ per cent. for the whole year; the payment of a bonus of 1 per cent. on ordinary shares, and the transfer to reserve account of £1,162 9s. 6d.

**Rivet, Bolt, and Nut Company.**

The sixth ordinary general meeting has been held at Glasgow. Mr. R. B. MacQuat presided. The Chairman moved the adoption of the report, which recommended a dividend on the ordinary shares for the year ended December 31st, 1905, at the rate of 5 per cent. per annum, less income-tax. The report was adopted.

**Bruce, Peebles and Co.**

The net trading profit for the year 1905, after providing for depreciation and all necessary charges in connection with the management of the business, amounts to £43,142 14s. 2d. Deducting directors' and managing directors' remuneration and auditors' fees interest on debentures and income tax, there is a balance of £43,142 14s. 2d. The directors recommend the payment of a dividend of 5 per cent. on the ordinary shares for the year to 31st December, 1905, at the rate of 64 per cent. per annum, less income tax, requiring £6,358 4s. 7d.; the writing off the whole of the preliminary expenses of the company and one-half of the expenses in connection with the new issue of shares and debentures in 1905, £8,030 19s. 7d.; transferring to general reserve account, £7,000; carrying forward £104,930.

**William Beardmore and Co.**

The report for 1905 states that the amount available for dividend is £128,680, which includes £95,025 brought forward. The directors propose to pay the preference dividend of 5 per cent. and a dividend of 6 per cent. on the ordinary shares, carrying forward £104,930.

**Johnson and Phillips.**

The directors state that the profit for the year on trading account, etc., after making provision for bad and doubtful debts, and after charging to revenue upwards of £4,000 for maintenance of buildings, plant, etc., there is an available balance of £11,769, out of which the directors propose the payment of a dividend at the rate of 7 per cent. per annum on the 175,000 ordinary shares, making £5,739, and to carry forward £6,030.

**Lincoln Wagon and Engine Company.**

The directors' report for the year ending December 31st, 1905, states that the balance at the end of profit and loss account after providing for bad and doubtful debts, directors' fees, and percentage of surplus profits due to managing directors and certain officials, and including interest on loans, was £11,002 9s. 6d. The directors recommend the payment of a further dividend of 5 per cent. on the preference shares, absorbing £11,002 9s. 6d.; the payment of a bonus at the rate of £3 per cent. (free of income tax) on the ordinary shares, absorbing £1,162 9s. 6d. (now making that fund £65,000); and to carry forward to the next account, £1,162 9s. 6d. The stock consists of 1,000,000 shares.

**Bell Brothers.**

The directors' report for the year ending December 31st, 1905, states that the balance at the end of profit and loss account after providing for bad and doubtful debts, directors' fees, and percentage of surplus profits due to managing directors and certain officials, and including interest on loans, was £12,000. The directors recommend a final dividend on ordinary shares at 4s. per share, free of income-tax, carrying forward £3,324. Resolutions will be submitted to shareholders to alter the articles of association so as to provide for directors' travelling expenses, and also to authorise the purchase of new machinery.

## New Companies Registered.

In the following list the registered addresses of New Companies are given, where ever possible. As, however, this information may be legally withheld until the actual date of commencing business, addresses are not always obtainable.

**Edward Wood and Co., 1906.**

£100,000 (£1). To acquire the business of engineers, etc., carried on by Edward Wood and Co., Ltd. 50,000 preference and 50,000 ordinary shares to be offered to the public. Minimum cash subscription, 10,000 of each class. First directors (not less than three nor more than seven): E. G. Wood, A. C. Holson, J. H. Humphreys, and A. Anderson. £500. According to profits.

**Wilson-Wolf Engineering Company.**

£3,000 (£1). Electrical, mechanical, and general engineers, copper-smiths, machinists, ironmongers, constructors of electrical trams, motor cars, and other vehicles, etc. No initial public issue. First directors (not less than two nor more than seven): J. H. Wilson, R. Wolf, H. Wilson, and L. F. Wolf. 300 shares. As fixed by the company. Laycock's Mill Thornton Road, Bradford.

**Thomas France and Sons.**

£10,000 (£1). Steam pipe cover carried on by T. France at 60 and 92, River Street, Bolton. No initial public issue. Registered without articles. 60 and 92, River Street, Bolton.

**Edmundson's.**

£2,000 (£1). Engineers, lighthouse engineers, manufacturers of buoys, buoy lamps, etc., ironmongers, cabinet-makers, upholsterers, and house decorators. Registered without articles of association and without registered office.

**Jackson and Phillips.**

£2,000 (£1). General engineers, etc. No initial public issue. Registered without articles. Dashwood House, 9, New Broad Street, E.C.



# J. POHLIG, LTD., COLOGNE.

Cheapest and most reliable  
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Absolutely Independent of Formation of Country.  
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Representative:

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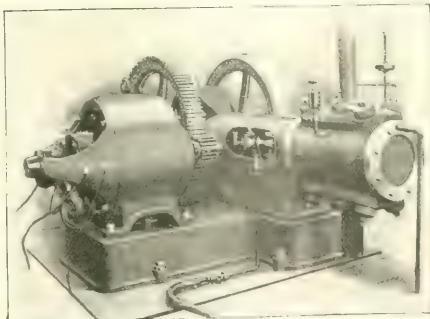


Telegraph: Address  
CAULKING, LONDON.

Telephone  
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LITTLE GIANT,  
WHITELAW,  
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PNEUMATIC DRILLS.  
KELLER HAMMERS  
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# PAGE'S WEEKLY

## Miscellaneous

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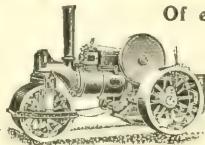
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Electric  
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Three Express Services Daily in Each Direction.

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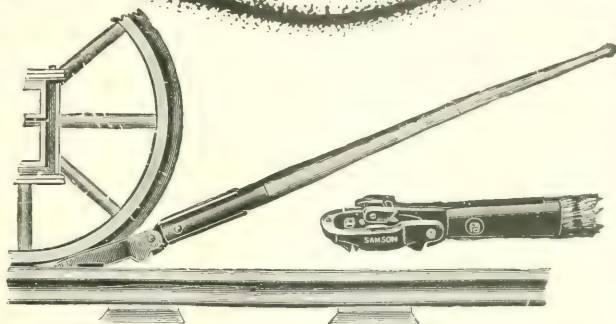
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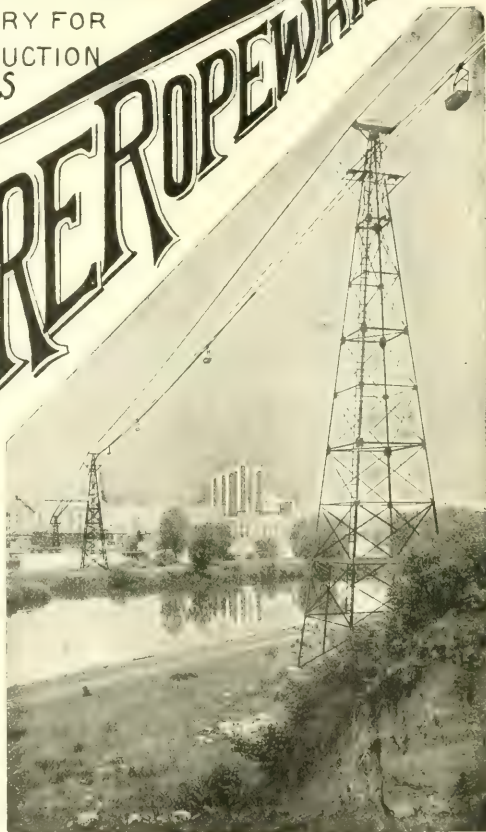
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# PAGE'S WEEKLY Oil Boxes & Lubricators

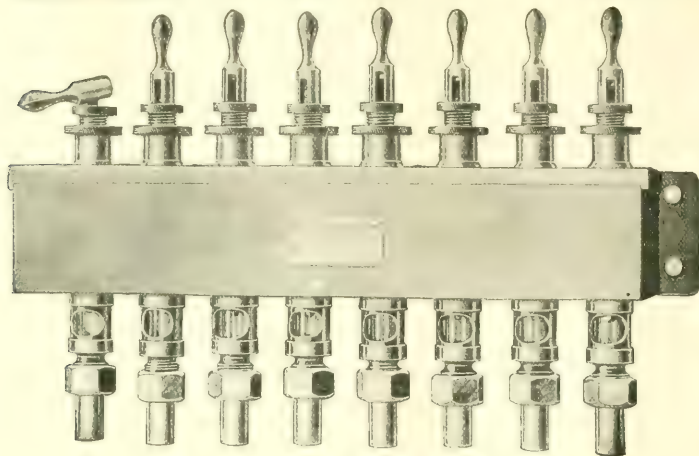
## HUNT & MITTON, ENGINEERS, BRASSFOUNDERS, &c.,

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This box is made of Polished Sheet Brass, and is fitted with two or more feeds as required, each feed may be worked separately or all at one time.

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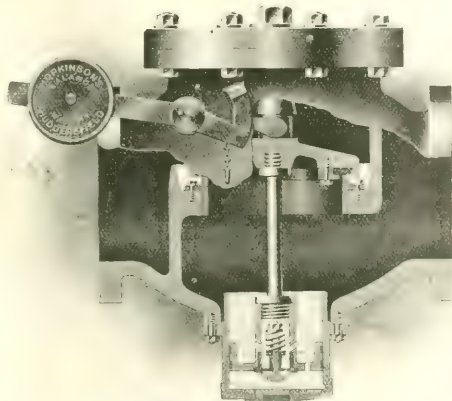
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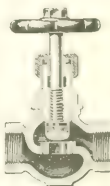
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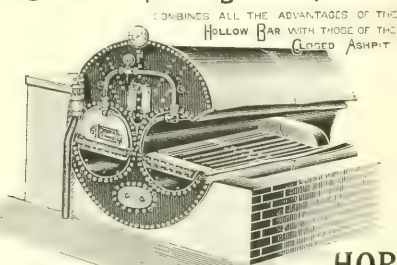
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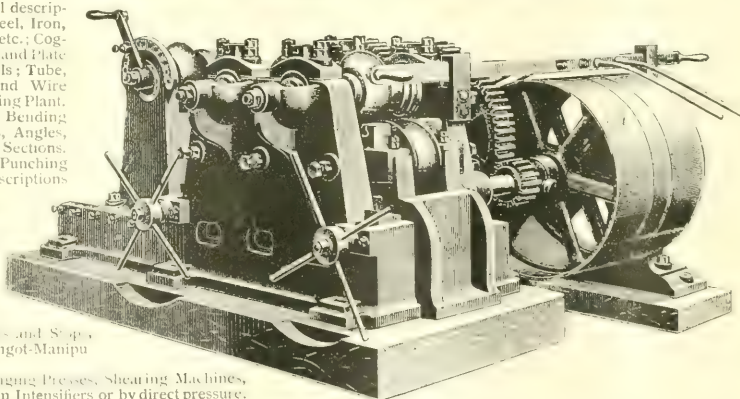
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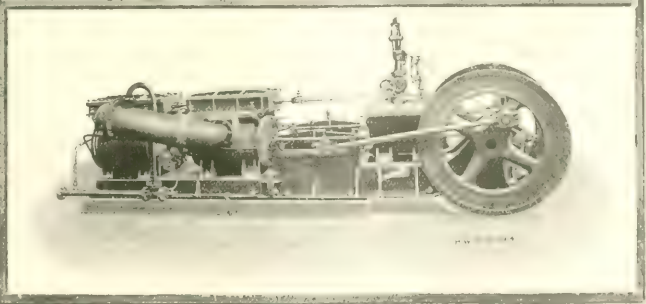
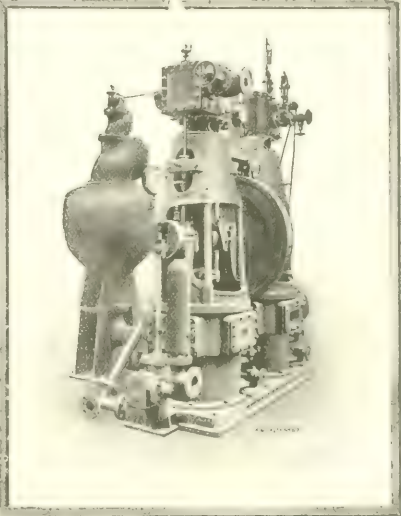
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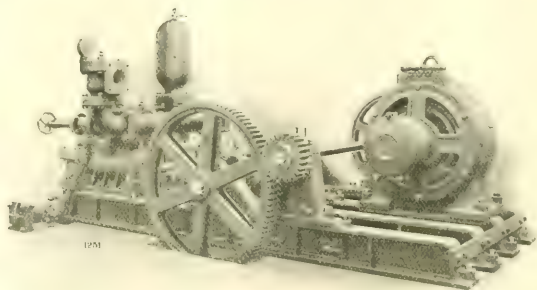


# PAGE'S WEEKLY Electrical Apparatus

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OF ALL DESCRIPTIONS CAN BE OBTAINED FROM

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SCOTT &  
MOUNTAIN**  
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**NEWCASTLE-ON-TYNE.**

This Illustration shows one of our Mining Pumps and Motors made for the Bengal Coal Co., Ltd., India.



This picture represents an Electrical Engineering Works in Yorkshire, which is specially laid out for the manufacture of Dynamos, Motors, Switches, and Switchboards. Everything is of the best, and prices are the lowest possible, consistent with best material and workmanship.

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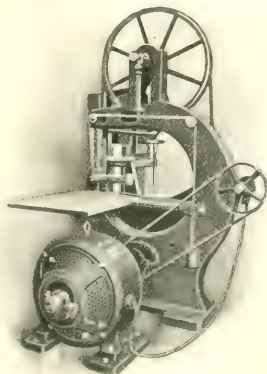
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# PAGE'S WEEKLY Electrical Apparatus

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Westinghouse Type S.B. Motor,  
operating a Band Saw.

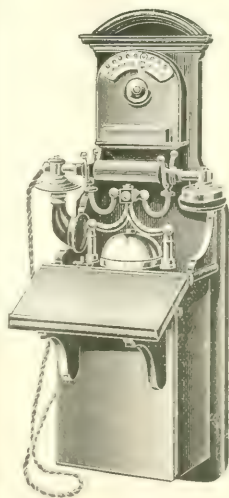
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## Miscellaneous

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BY

## JOHN Z. THOM,

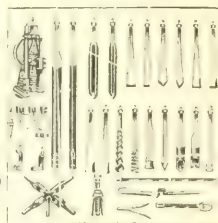
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Contractor to

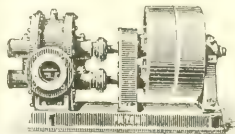


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## Miscellaneous



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2nd. 11.0 a.m. From Victoria Station.	5.45 p.m.	2nd. 11.0 a.m. For Intermediate Stations.	2nd. 11.0 a.m. For Intermediate Stations.
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# PAGE'S WEEKLY

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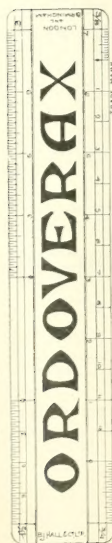
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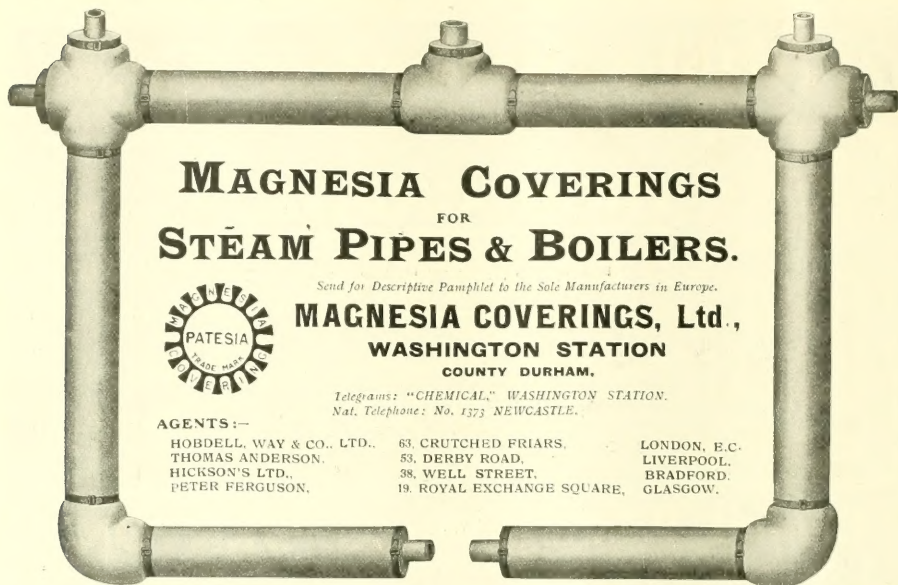
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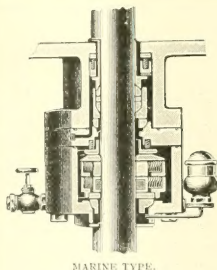
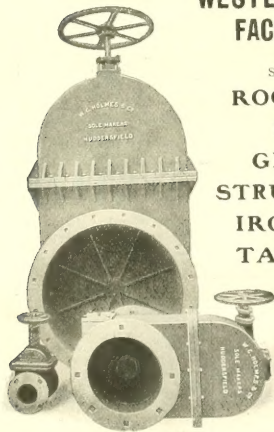
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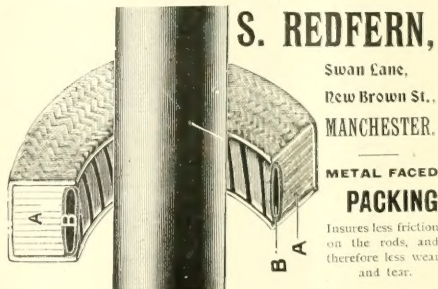
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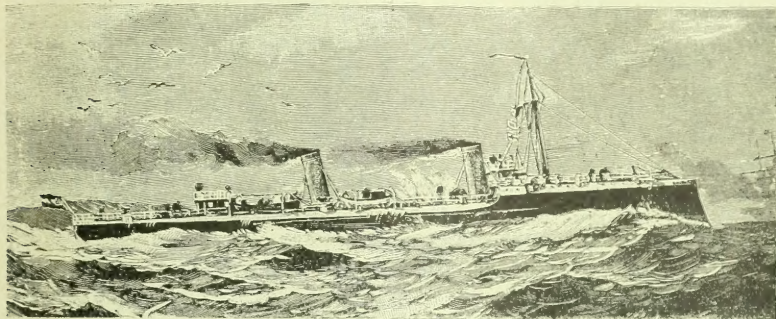




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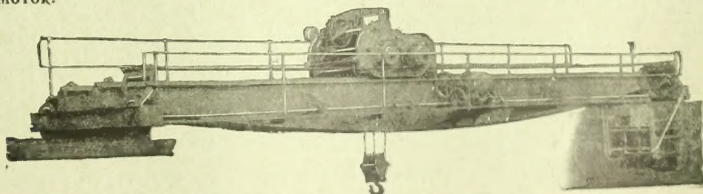
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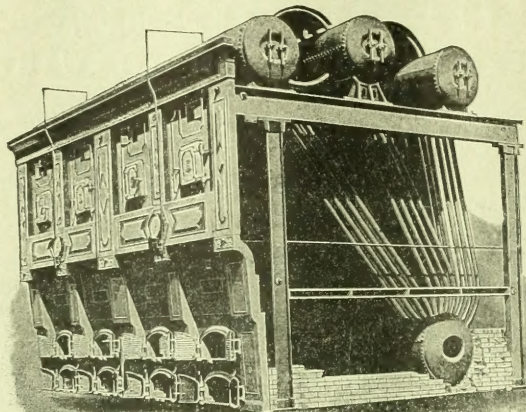
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